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ENVIRONMENTAL NOISE ASSESSMENT
CITY OF GRAND PRAIRIE, TEXAS

U. S. ENVIRONMENTAL PROTECTION AGENCY
REGION VI
DALLAS, TEXAS

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16. ABSTRACT

Report presents a successful, relatively inexpensive environmental noise assessment of the metropolitan area of Grand Prairie, Texas. The methodology included use of the readily available Type-2 sound level meter which is simple enough to be operated by a layman. Readings from the sound level meter were made every 10 seconds and recorded manually on data sheets. A separate data sheet was used for each hour in order to observe the changes in noise levels at various times of day. This and previous studies have demonstrated that this methodology is sufficient for the purpose of community noise surveys to assist local planner, etc. Noise measurements were made at eight locations; several sites were located near suspected major sources of noise, namely, the Dallas/Fort Worth Airport, Dallas Naval Air Station, and LTV Aerospace Corp. It was concluded that environmental noise exposure in one portion of the city presents a possible risk of permanent hearing damage to persons living in that area, and that in this area and still another portion of the city noise exposure was high enough to be unsuitable for residential development.

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CITY OF GRAND PRAIRIE, TEXAS

A JOINT PROJECT OF THE U.S.
ENVIRONMENTAL PROTECTION AGENCY,
CITY OF GRAND PRAIRIE, AND THE
TEXAS STATE DEPARTMENT OF HEALTH

by

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HAZARDOUS MATERIALS CONTROL DIVISION

CITY OF GRAND PRAIRIE

U. S. Environmental Protection Agency, Region VI
Dallas, Texas 75201

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ABSTRACT

This report presents a successful, relatively inexpensive environmental noise assessment of the rapidly growing metropolitan area of Grand Prairie, Texas, located between Dallas and Fort Worth. The methodology included use of the readily available Type-2 sound level meter which is simple enough to be operated by a layman.

Readings from the sound level meter were made every 10 seconds and recorded manually on data sheets especially designed for this methodology. A separate data sheet was used for each hour in order to observe the changes in noise levels that occur at various times of day. An ordinary cassette magnetic tape recorder was used to microsample for the purpose of noise source identification, and inexpensive hand-held weather instruments were used to measure conditions which might have affected the noise monitoring. Also, field calibration of each sound level meter was done hourly by means of an acoustical calibrator.

This and previous studies by EPA Region VI have demonstrated that this methodology is sufficient

for the purpose of community noise surveys to assist local planners, and that citizen volunteers, such as used in this project, can successfully make the necessary sound level measurements.

Environmental noise measurements were made at eight locations encompassing the city, and representing a number of noise sensitive land uses. Several sites were located near suspected major sources of noise, namely the Dallas/Fort Worth Airport, Dallas Naval Air Station, and LTV Aerospace Corporation.

From the data obtained in this assessment, it can be concluded that the environmental noise exposure in one portion of the city presents a possible risk of permanent hearing damage to those persons living in that area, and that in this area and still another portion of the city, the environmental noise exposure is high enough to be unsuitable for residential development. Furthermore, it can be concluded that jet aircraft, both military and commercial, and the testing of jet engines are the primary sources of noise pollution in Grand Prairie. City officials should take steps to adopt proper land use zoning in these impacted areas, and should enter into informal

negotiations with LTV Aerospace Corporation and the Dallas Naval Air Station to reduce the impact of jet aircraft operation and testing, especially by reducing nighttime activity. In addition, the City should develop and pass a comprehensive noise control ordinance with decibel limits to supersede the existing ordinances.

This report represents the culmination of a cooperative effort between Region VI of the U. S. Environmental Protection Agency, the City of Grand Prairie, and the Texas State Department of Health.

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Our sincere thanks also go to the many citizens of Grand Prairie who volunteered their time to operate the noise monitoring stations on an around-the-clock schedule under a variety of uncomfortable conditions.

Riaz Sheikh, Southern Methodist University graduate student, was responsible for the data reduction. Mike Dorey, a summer employee at EPA who attends New Mexico State University, assisted in the data reduction.

Acknowledgement is given to Horace Adrian, Administrator, Occupational Health Branch, and Jerry Lauderdale, Chief, Industrial Hygiene Program, Division of Occupational Health and Radiation Control, Texas State Department of Health, for their efforts in the coordination of State participation in the project, and for providing personnel and noise monitoring equipment. Recognition is also given to the Division

of Occupational Safety, Texas State Department of Health, for noise monitoring equipment used in this project.

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I. INTRODUCTION

The Environmental Protection Agency's noise control activities are authorized by the "Noise Pollution and Abatement Act of 1970" (Title IV of the Clean Air Act), and the "Noise Control Act of 1972". The broad mission of the new EPA Office of Noise Abatement and Control, established in April 1971, is to identify and classify causes and sources of noise and determine their effects on public health and welfare. The enabling legislation requires that a special report to Congress be prepared which will include information on present Federal programs, State and local laws, regulations, and enforcement capabilities. This report will also contain the state-of-the-art on control technology and recommendations on a long-range National noise abatement and control program. The law also requires that, for the first time, all Federal agencies include noise as a consideration in preparing statements describing the environmental impacts of their various projects.

The law further directs the Environmental Protection Agency to develop criteria with respect to

noise, to publish information on the levels of environmental noise required to protect public health and welfare, and to identify major sources of noise. The Environmental Protection Agency is also directed to propose noise emission standards for identified major sources of noise.

In support of the national mission, and at the request of the City of Grand Prairie, Texas, the Region VI Environmental Protection Agency noise program developed and implemented an environmental noise assessment in Grand Prairie. The Grand Prairie area was of particular interest to the EPA Region VI Office because of the possible impact of aircraft noise from the new Dallas/Fort Worth Airport, the world's largest, and from the Dallas Naval Air Station.

The Environmental Health Department, located within the Division of Urban Development, has the responsibility for the noise control efforts undertaken by the City of Grand Prairie. The department is staffed by a Registered Sanitarian, two Sanitation Inspectors, two Animal Control Officers, and two secretaries.

The city has acoustic performance standards which are part of the zoning ordinance. Noise standards for light and heavy industrial and planned unit development zoning districts are prescribed in terms of maximum decibel band limits in octave band frequencies at the property boundaries.

In April of 1973, the City Council authorized the purchase of noise monitoring equipment in order to test for compliance with the city's noise standards. The equipment purchased included a General Radio precision sound level meter and analyzer, additional microphones, windscreens, power supply, calibrator, and recorder.

The Director of Environmental Health and Sanitation Inspectors have participated in a number of training programs in noise pollution, testing, and control. They also attended the recently completed noise workshop sponsored by the Environmental Protection Agency in Dallas July 11-12.

The Environmental Health Department has conducted several noise monitoring tests throughout the city upon receipt of the proper equipment both on their own initiative and as a response to noise complaints

from the public. The city also carefully reviews applications for new developments for potential noise hazards. Only recently, the City Council declined to approve the location of a miniature Grand Prix entertainment facility because noise tests indicated it would not be compatible with surrounding development.

The city maintains cooperative programs with other local, State, and Federal agencies including the Texas State Department of Health and the Environmental Protection Agency. The community noise analysis conducted in April, 1974 is a prime example of the intergovernmental cooperation in the field of noise control in which the City of Grand Prairie is involved.

Currently, there are no comprehensive state noise laws in Texas. Citizen inquiries and complaints concerning environmental noise are referred to the Texas State Department of Health, Division of Occupational Health and Radiation Control. Division personnel evaluate noise conditions and work with citizens, local governments, the Environmental Protection Agency, industry, and other groups to monitor and to reduce the impact of environmental noise. These duties are

performed in conjunction with the Division's responsibilities including industrial noise exposure. Other areas of concern include public education about the extent and nature of environmental noise problems. The Division also provides technical information and support for State legislators considering adoption of effective environmental noise laws.

II. OBJECTIVES

The objectives of this project were:

1. To measure environmental noise levels in noise sensitive land use areas in a rapidly growing metropolitan area of approximately 65,000 persons for the purpose of:

   a. Obtaining an environmental noise assessment of the area for land use planning, zoning and future development of the metropolitan area;

   b. Determining the impact of commercial, private, and military aircraft operations from Dallas/Fort Worth Airport and Dallas Naval Air Station;

   c. Determining the effects of ground transportation and stationary noise sources;

   d. Assessing the City's needs for new noise control legislation.

2. To train City personnel in noise measurement methodology.

3. To promote public awareness of environmental noise, its measurement, and its control.

III. DESCRIPTION OF GRAND PRAIRIE, TEXAS

The geographic center of the Dallas/Fort Worth Metropolitan Area, internationally known as the "Southwest Metroplex," is Grand Prairie, Texas. Located between the two major metropolitan cities, Grand Prairie is also the population center of the nation's ninth-ranked (population) SMSA. With a current estimated population of 65,000, the city isprojected to almost double its population to 1.2,000 by 1990.

The present 68 square miles of the City encompasses a wide range of industrial, commercial, recreational and residential developments. Sixty percent of the Great Southwest Industrial District lies within the boundaries of Grand Prairie. The downtown area is approximately a twelve-minute drive from the Dallas/Fort Worth Regional Airport to the north. The City is also the home of a number of year-round tourist attractions including Lion Country Safari, the Southwestern Historical Wax Museum, the Chapman Collection (antique automobiles), Paramount Pictures' Sportsworld (sports wax museum), and the Texas Sports Hall of Fame. Other amusement parks and tourist attractions are

currently in the planning stages.

The business district in Grand Prairie includes more than 600 establishments rated by Dunn and Bradstreet. The industrial potential of the City is enhanced by its strategic location midway between Dallas and Fort Worth which enables the City to draw from the combined labor pool of Dallas and Tarrant Counties and the rapidly growing neighboring communities. The City's tax rate of $1.00 per $100 (60% valuation) is one of the lowest in the state. Total taxes for all taxing authorities make the city's rate the sixth lowest in Texas for cities with a population in excess of 60,000.

Grand Prairie is linked to the entire region through an intricate network of highways, bus lines and rail freight service. The Dallas/Fort Worth Turnpike runs the entire east-west length of the City. Both Dallas and Fort Worth are a thirty-minute drive by automobile. U. S. Highway 80 also links the City to the east and west with Dallas, Fort Worth and Arlington. Additional east-west access will be provided by Interstate 20 scheduled for completion in early 1975.

North-south access is provided by Belt Line Road

which connects the City to Irving and is a major road in the Dallas County Thoroughfare System. State Highway 360 to the west provides immediate access to the Regional Aiport located to the north. State Highway Loop 9, immediately west of the downtown area, is scheduled to run north through the entire city and provide a complete outer loop around Dallas County.

Population has increased from 30,386 in 1960 to its current estimate and projections indicate a population of 96,200 by 1985. Median income is $10,250 with an estimated 41% of households earning $10,000 per year. Six financial institutions, including three banks and three savings and loan associations, have deposits in excess of $100 million.

The City adheres to the Council-Manager form of government with the Mayor and four council members being popularly elected. Administration of the City's operations is conducted by the City Manager and a City employee labor force of almost 400. The City has consistently been cited for its efforts in the field of civic improvements including awards from major national organizations and three special awards from the Governor's Office of the State of Texas.

IV. DESIGN OF MONITORING PROGRAM AND DESCRIPTION OF MONITORING METHODOLOGY

After reviewing personnel and equipment limitations, it was decided that eight sampling sites would be chosen. Potential sampling sites were assessed according to the following criteria:

1. Noise sensitivity and discreteness of land use.
2. Absence of a single dominant noise source internal to the immediate area being sampled.
3. Possible impact of noise sources external to the immediate area being sampled.
4. Projected population growth.
5. Safety of persons performing the monitoring.

Noise sources which were expected to merit the greatest attention included air traffic using the new Dallas/Fort Worth Airport, the LTV jet engine testing facility, the Dallas Naval Air Station, and the railroad passing through the center of town.

The schedule for data collection was designed to provide information for both weekend and normal work days. Both day and night data was collected on an hourly basis in order to observe changes in the noise

levels as a function of time. Analog magnetic tape recordings were made for the purpose of identifying noise sources. By knowing both the hourly noise levels and the major contributing sources of noise, it would be possible to develop effective controls for noise generating activities that proved to be a problem. For example, this information would be of the type needed for the City to adopt curfews as part of a new noise control code.

It was intended that enough data be collected at each site to obtain the A-weighted Day-Night Average Noise Level. This was done in order to comply with the recommendations for measurement of community noise levels stated in the EPA document Information on Levels of Environmental Noise Requisite To Protect Public Health and Welfare with an Adequate Margin of Safety.

A station consisted primarily of a Type-2 "hand-held" sound level meter that was mounted on a tripod along with a stopwatch. Each station was also equipped with a cassette magnetic tape recorder, an acoustical calibrator, and a simple weather station. The station

operator was seated in a folding chair and was provided a clipboard for holding the data sheets.

At the beginning of each hour of data collection, the sound level meter was calibrated, and the condition of the batteries for the sound level meter was checked. Then, A-weighted noise levels were recorded manually on a data sheet at ten-second intervals. At five-minute intervals, the cassette tape recorder was turned on for about 20 seconds to provide documentation of the types of noise sources. After 20 minutes of data collection, the station operator interrupted the noise data collection to measure and record the speed and direction of the wind and the sky condition. After a ten-minute pause, the noise data collection was resumed for another 20 minutes. The final ten minutes of the hour were spent recalibrating the sound level meter, and answering a short questionnaire provided at the top of the data sheet. The purpose of this questionnaire was to identify noise sources and to obtain the station operator's impressions of the noise conditions. A separate data sheet was used for each hour of data collection, and data collection commenced at the beginning of each clock hour.

The hand-held meter stations were operated by citizens and employees of the City of Grand Prairie, and by trainees from EPA.

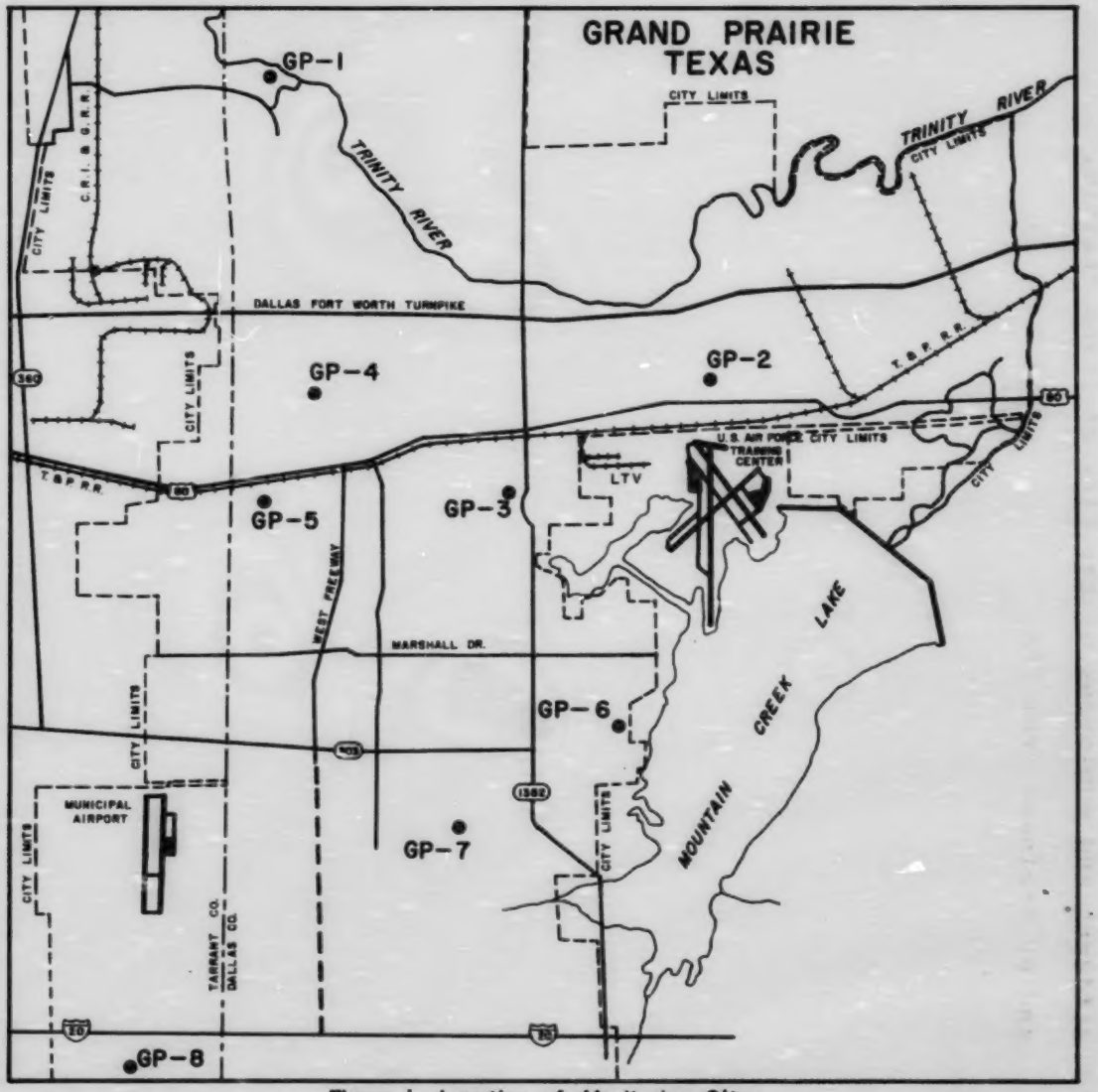

Figure I. Location of Monitoring Sites

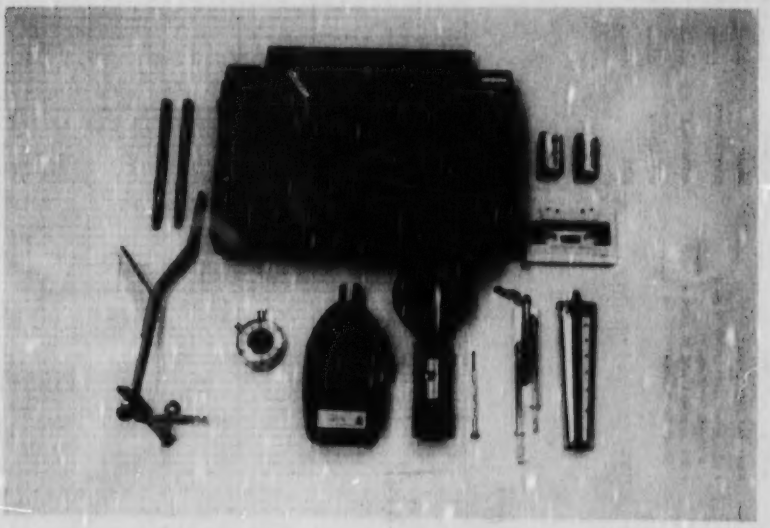

Figure 2. -- Equipment for a "Hand-Held" Meter Station

COMMUNITY NOISE ASSESSMENT DATA SHEET

LOCATION GRAND PRAIRIE, TEXAS

STATION NUMBER: _____

OPERATOR: _____

DAY OF WEEK: _____ DATE: _____ DAY: _____ WIND: _____

CHECK BATTERY: _____ TIME: BEGIN _____ FINISH _____

METER ON "FAST" POSITION: _____ CAL. BEGIN _____ FINISH _____

METER ON A-WEIGHTING: _____

WET BULB TEMPERATURE
TEMPERATURE
RELATIVE HUMIDITY
WIND SPEED (MPH)
WIND DIRECTION (0-1, 2-3, 5-6, 7-8)
BAROMETRIC PRESSURE (mm Hg)

VARIATION AND BACKGROUND

LOW BACKGROUND ____
MED. BACKGROUND ____
HIGH BACKGROUND ____
VERY FEW VARIATIONS ____
SOME VARIATIONS ____
MANY VARIATIONS ____
SOFT VARIATIONS ____
MEDIUM VARIATIONS ____
LOUD VARIATIONS ____

OVERALL DESCRIPTION

QUIET & PEACEFUL ____
SOME NOISE BUT PLEASANT ____
NOT ALWAYS PLEASANT NOTICEABLE NOISE ____
NOISY BUT PLEASANT ____
NOISY BUT UNPLEASANT ____
I WOULD NOT MIND LIVING IN SUCH A SOUND ENVIRONMENT ____
I WOULD MIND LIVING IN SUCH A SOUND ENVIRONMENT ____

SOURCE QUESTIONNAIRE

MARKED: P= PRIMARY, S= SECONDARY, O= NOT AUDIBLE

EMERGENCY VEHICLE	____	INDUSTRIAL	____
LIGHT AIRCRAFT	____	COMMERCIAL	____
LARGE AIRCRAFT	____	RESIDENTIAL	____
RAILROAD	____	MUSIC	____
TRUCK	____	INSECTS	____
CONSTRUCTION	____	BIRDS	____
AUTOMOBILE	____	DOGS	____
MOTORCYCLE	____	RECREATIONAL	____
BOAT	____	OTHER	____

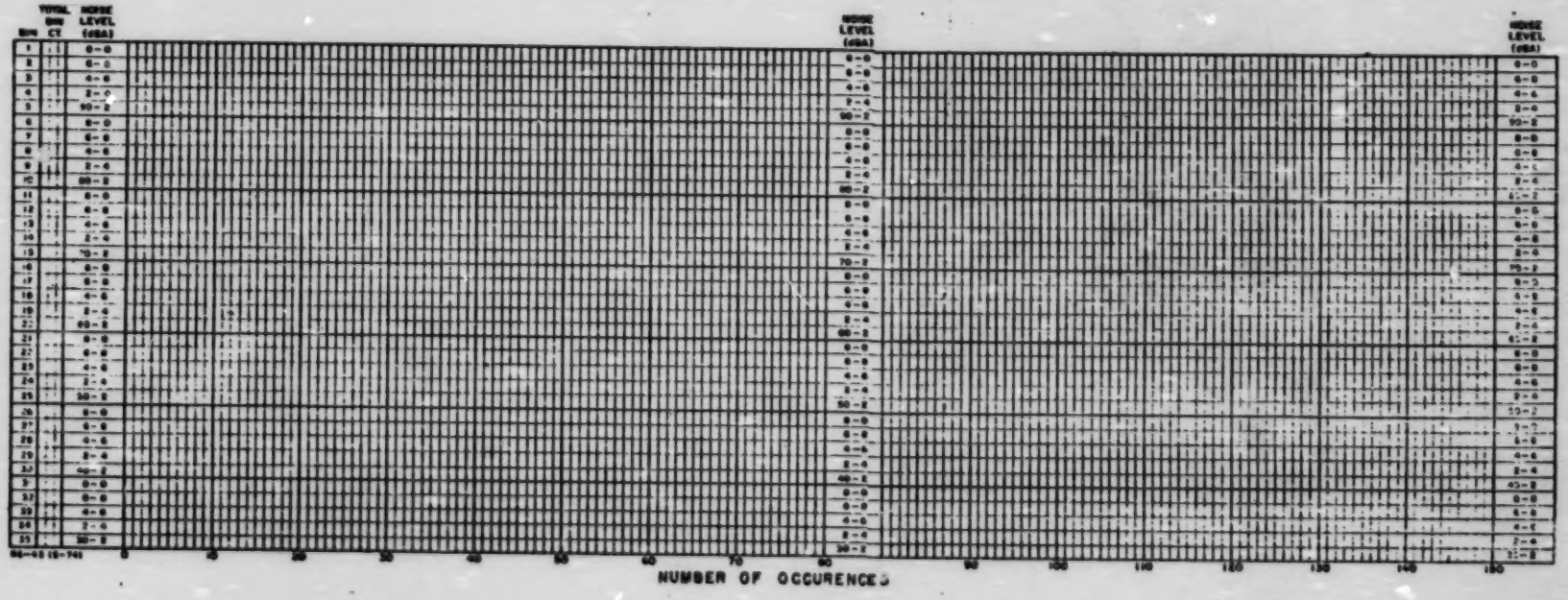

Figure 3. Data Sheet for a "Hand-Held Meter" Station

TABLE 1.

EQUIPMENT LIST FOR "HAND-HELD METER" STATION

Type-2 Sound Level Meter

Windscreen for Sound Level Meter Microphone

Stopwatch with Sweep Second Hand

Tripod

Cassette Tape Recorder with External Microphone

Windscreen for Tape Recorder Microphone

Magnetic Tape Cassettes

Sound Level Calibrator

Screwdriver for Calibration of Sound Level Meter

Weather Station (Sling Psychrometer, Wind Speed Meter, Compass)

Data Sheets

Clipboard or Small Table

Marking Pens

Spare Batteries for all Equipment

Watch with Time of Day

Flashlights or Lanterns (Night Stations)

Folding Chair

V. DISCUSSION

Data Reduction Methods

A total of 255 hourly data sheets were collected from the hand-held meter stations. All of the pertinent data from each sheet was transferred to computer coding forms according to a predetermined format. Then computer cards were punched from the forms. Included as input to be stored, manipulated, and printed were site, date, hour, weather, major and minor noise sources, and the number of data samples taken at each noise level. Outputs computed included L_{max}, L_{01}, L_{10}, L_{50}, L_{90}, L_{99}, L_{min}, TNI, L_{np}, and L_{eq} statistics which were computed for each hour from approximately 230 data samples of the dBA sound pressure level taken at 10 second intervals. Daily statistics were also computed and included all of the above plus the L_{dn}. Besides the level statistics, correlation coefficients were computed over the hourly statistics L_{10}, L_{50}, and L_{eq} to determine to what degree if any these statistics were interdependent.

Results of Data Reduction

Statistical noise levels for each site-day can

be seen in Appendix A along with detailed site descriptions.

A comparison of the individual site noise levels for each day was made with certain criteria levels which have been identified as significant with regard to activity interference and hearing protection. This comparison can be seen in Table 2 in which levels and time periods deemed important by the Federal Highway Administration, U. S. Department of Transportation, by EPA Office of Noise Abatement and Control, and by the Department of Housing and Urban Development are displayed. In the table, an asterisk has been used to note when a criteria has been equaled or exceeded by a site noise level daily average. All of the eight monitoring sites equaled or exceeded at least two of the criteria during each sampling day. A rank ordering of the sites in order of lowest number of exceedances to highest number of exceedances can be seen in Table 3.

Throughout the investigation, certain noise level statistics appeared to be highly correlated with others. To test this, correlation coefficient for L_{10} and L_{eq} was calculated within 99% confidence limits for

each site and day. Correlation coefficients were also computed for L_{10} and L_{50}, and for L_{50} and L_{eq}. These correlation coefficients are displayed in Table 4.

Cassette Tape Noise Source Identification

During all of the hand-held meter data gathering, eight twenty-second tape recordings of the background noise were made each hour at each site. After the survey was completed, the tapes were played back and the noise sources identified for each site and hour. No attempt was made to establish noise levels from the tapes. The list of sources taken from listening to the tapes was compared to the list compiled by data gatherers in the field. Based on this comparison the following conclusions were reached.

1. In general, noise sources listed on the data sheets could be heard on the tapes. Notable exceptions included automobiles and light aircraft.

2. Rarely were sources heard on the tapes that were not listed on the data sheets.

3. The use of external microphones equipped with windscreens made from Nerf balls were very effective in reducing wind noise. Also, the superior

directional properties of the external microphones improved the recordings over those made with built-in microphones. These comparisons were made by recording on one channel of the stereo recorder with the built-in microphone and recording on the other channel with an external microphone.

4. Some station operators allowed the batteries on the tape recorder to become excessively drained resulting in frequency and temporal changes in the recorded sounds when played back at a later time.

5. Station operators frequently interfered with the tape recordings by talking or making other noises while recording.

TABLE 2.

DAILY CRITERIA EXCEEDANCES

NO.	DAY	DAILY CRITERIA LEVELS	SITE							
			GP-1	GP-2	GP-3	GP-4	GP-5	GP-6	GP-7	GP-8
1.	a.	$L_{10} \geq 60$	*	*	*	*				*
	b.			*			----			*
2.	a.	$L_{10} \geq 70$		*						
	b.			*			----			*
3.	a.	$L_{eq} \geq 55$	*	*	*	*	*	*	*	*
	b.		*	*	*		----			*
4.	a.	$L_{dn} \geq 55$	*	*	*	*	*	*	*	*
	b.		*	*	*	*	----	*	*	*
5.	a.	$L_{eq} \geq 70$		*						
	b.			*			----			
6.	a.	$L_{dn} \geq 70$		*						
	b.			*			----			*
7.	a.	$\geq$81 for 4.2% of time								
	b.						----			
8.	a.	$\geq$75 for 33.3% of time								
	b.						----			
9.	a.	$\geq$65 for 33.3% of time								
	b.						----			
10.	a.	$\geq$45 for 33.3% of time	*	*	*	*	*	*	*	*
	b.		*	*	*	*	----	*	*	*

a. Denotes first day of sampling b. Denotes second day of sampling * Denotes a criteria has been equaled or exceeded
---- Denotes no data

Criteria 1. and 2. are designated by F.H.W.A. in highway planning for proper land use as maxima for residential and park areas.

Criteria 3., 4., 5., and 6., are identified by E.P.A. as important measures for protection against activity interference and hearing loss.

Criteria 7., 8., 9., and 10., are identified by H.U.D. for planning new housing areas.

TABLE 3.

SITES RANKED IN ORDER OF QUIETNESS

SITE	DESCRIPTION (MAJOR NOISE SOURCE)
GP-6, GP-7	PARK (jet aircraft), OPEN FIELD NEAR FIRE STATION (jet aircraft)
GP-4	CITY PARK NEAR SCHOOL AND RESIDENCES (jet aircraft, vehicular traffic)
GP-1, GP-3	PARK (jet aircraft), PARKING LOT NEAR FOOTBALL FIELD (jet aircraft, vehicular traffic)
GP-2	OPEN FIELD NEAR FIRE STATION AND RESIDENCES (jet aircraft, jet engine testing)

TABLE 4.

CORRELATION OF NOISE LEVEL STATISTICS

SITE	DATE	TOTAL HOURS OF DATA	r_1 & L_{10} & L_{eq}	r_2 & L_{50} & L_{eq}	r_3 & L_{10} & L_{50}
GP-1	4/19	24	.857	.813	.917
GP-1	4/20	9	.828	.713	.696
GP-2	4/19	24	.910	.897	.932
GP-2	4/20	22	.832	.843	.831
GP-3	4/19	24	.937	.797	.845
GP-3	4/20	18	.485	.670	.604
GP-4	4/19	14	.988	.903	.900
GP-4	4/20	8	.917	.797	.708
GP-5	4/19	15	.828	.751	.899
GP-5	4/20		NO DATA		
GP-6	4/19	22	.880	.484	.595
GP-6	4/20	7	.936	.414	.275
GP-7	4/19	22	.689	.602	.678
GP-7	4/20	17	.810	.236	.106
GP-8			DATA NOT AVAILABLE DUE TO TECHNICAL PROBLEMS		
MEAN ABSOLUTE CORRELATION			.84	.69	.64

VI. CONCLUSIONS

The results of this environmental noise assessment reveal two major noise problem areas in Grand Prairie. The more serious problem area is that portion of the City within two miles of LTV Aerospace Corporation and the Dallas Naval Air Station where there is jet engine testing and military jet aircraft operations. Within one-half mile of these facilities the levels are sufficiently high to be above the EPA identified level for protection against noise induced permanent hearing loss. However, these levels are within the 5 dBA margin of safety afforded by this EPA identified level. The noise level within one-half mile of LTV Aerospace Corporation and the Dallas Naval Air Station is also substantially above the EPA identified level for protection against communication and sleep interference.

The lesser of the two major problem areas is the northwestern portion of the City within three to four miles of the southern boundary of the Dallas/Fort Worth Airport. The noise in this area, represented by sampling site #1 at LTV Employee Park, exceeds the EPA identified

level for protection against communication and sleep interference. Site #1 is located in Zone B of the Aircraft Sound Exposure Map for Dallas/Fort Worth Airport prepared in 1971 by the North Central Texas Council of Governments. This zone (NEF 30-40) is called the "middle zone of effect" and is an area where residential development is not considered to be a suitable land use and where construction of auditoriums, schools, churches, hospitals, theatres, and like structures should be avoided. It should also be pointed out that H.U.D. has judged areas of similar noise exposure to be "normally unacceptable." The noise level here does not present a permanent hearing loss risk, however.

The other areas of the City which were assessed exceed or approach the EPA identified level for communication and speech interference. The cause for these noise levels is ground transportation -- automobiles, trucks, railroad, and motorcycles. The condition of the exhaust muffler system, and the number and operation of these vehicles are primary factors which determine the noise levels.

VII. RECOMMENDATIONS

The City of Grand Prairie could take the following several measures to improve the acoustic environment:

1. The City should enter into an informal curfew agreement with LTV Aerospace Corporation to restrict nighttime jet engine testing between the hours of 7 p.m. and 7 a.m. -- the hours during which most persons are at their homes. At the very least, such activity should be restricted between the hours of 10 p.m. and 7 a.m. during which time many persons are sleeping.

2. The City should make an informal appeal to the Commander of the Dallas Naval Air Station to reduce the number of military jet aircraft flights, especially during nighttime hours, at low altitudes over residential areas.

[Note: It should be pointed out that even though LTV and the Dallas Naval Air Station are not within the boundaries of Grand Prairie, they are required to cooperate with local environmental standards under Executive Order 11752 (Federal Register, Vol. 38, No. 243, Wednesday, December 19, 1973).]

3. The City consider the adoption of land use zoning and building codes which relate to future aircraft noise problems which would arise due to development of noise sensitive land uses close to the Dallas/Fort Worth Airport --a major jetport.

4. The City of Grand Prairie should study and adopt a comprehensive noise control ordinance which contains stationary noise source standards with limits in A-weighted decibels. In addition, this ordinance should regulate mobile noise sources, particularly transportation and construction equipment, and should provide for concurrent enforcement of applicable Federal noise standards, such as the EPA standards for motor carriers and new products. The EPA Region VI Office could be a valuable resource to the City of Grand Prairie in designing a modern, viable noise control ordinance. The noise standards contained in the City's existing zoning law should be updated to include decibel limits in the new octave band center frequencies and in A-weighted decibels. The standards

in this zoning law should also be reviewed in light of new information now available from EPA, especially the EPA document Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety and Executive Order 11752.

VIII. GLOSSARY

dB-Decibel - Twenty times the logarithm to base ten of the ratio of the sound pressure to a reference pressure of 20 micronewtons per square meter.

A-weighting - An electrical filter network employed in sound level meters to cause a meter to filter out very low and very high frequency components of sound so that the instrument response is closely correlated with human response to sound.

dBA - Sound pressure level measured after signal has been A-weighted.

Type 2 Sound Level Meter - A sound level meter which meets or exceeds the American National Standards Institute Standard S1.4-1971 for Type 2 General Purpose Sound Level Meters.

L_{10} - The sound pressure level in dBA which is exceeded ten percent of the time.

L_{50} - The sound pressure level in dBA which is exceeded fifty percent of the time.

L_{90} - The sound pressure level in dBA which is exceeded ninety percent of the time.

L_{eq} - Energy average sound pressure level in dBA over a known sampling period. It represents a constant sound pressure level which yields the same overall sound energy during the sampling period as all of the sources did which were actually present and causing a time varying sound level. It is computed from the following formula:

$$L_{eq} = 10 \log_{10}\left(\frac{1}{\sum_{i=1}^{N} S_i} \sum_{i=1}^{N} S_i 10^{L_i/10}\right)$$

where L_i is the sound pressure level observed for S_i occurrences or over time S_i. N represents the number of different discrete levels the sound pressure level scale is divided into.

$\sum_{i=1}^{N} S_i$ represents the total number of occurrences or total sampling time.

L_{dn} - A day-night weighted twenty-four hour energy average sound pressure level. It is computed like the L_{eq} except

that a 10 dB is added to levels summed over nighttime period 2200-0700 hours. The formula is:

$$L_{dn} = 10 \log_{10}\left(\frac{1}{D}\sum_{d=1}^{N} S_d 10^{L_d/10} + \frac{1}{B}\sum_{n=1}^{N} S_n 10^{\frac{L_n+10}{10}}\right)$$

where L_d is the sound pressure level observed for S_d occurrences at all N levels during the fifteen hour period from 0700-2200. L_n is the sound pressure level observed for S_n occurrences of the total number B of night occurrences, at all N levels during the nine hour period from 2200-0700.

L_{np} - Noise Pollution Level - computed from the formula:

$$L_{np} = L_{50} + (L_{10} - L_{90}) + \frac{(L_{10} - L_{90})^2}{60}$$

TNI - Traffic Noise Index - computed from the formula:

$$TNI = 4(L_{10} - L_{50}) + L_{90} - 30$$

IX APPENDICES

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B.	Instructions for Noise Monitoring Station	81

APPENDIX A

SITE DESCRIPTIONS AND NOISE LEVEL INFORMATION

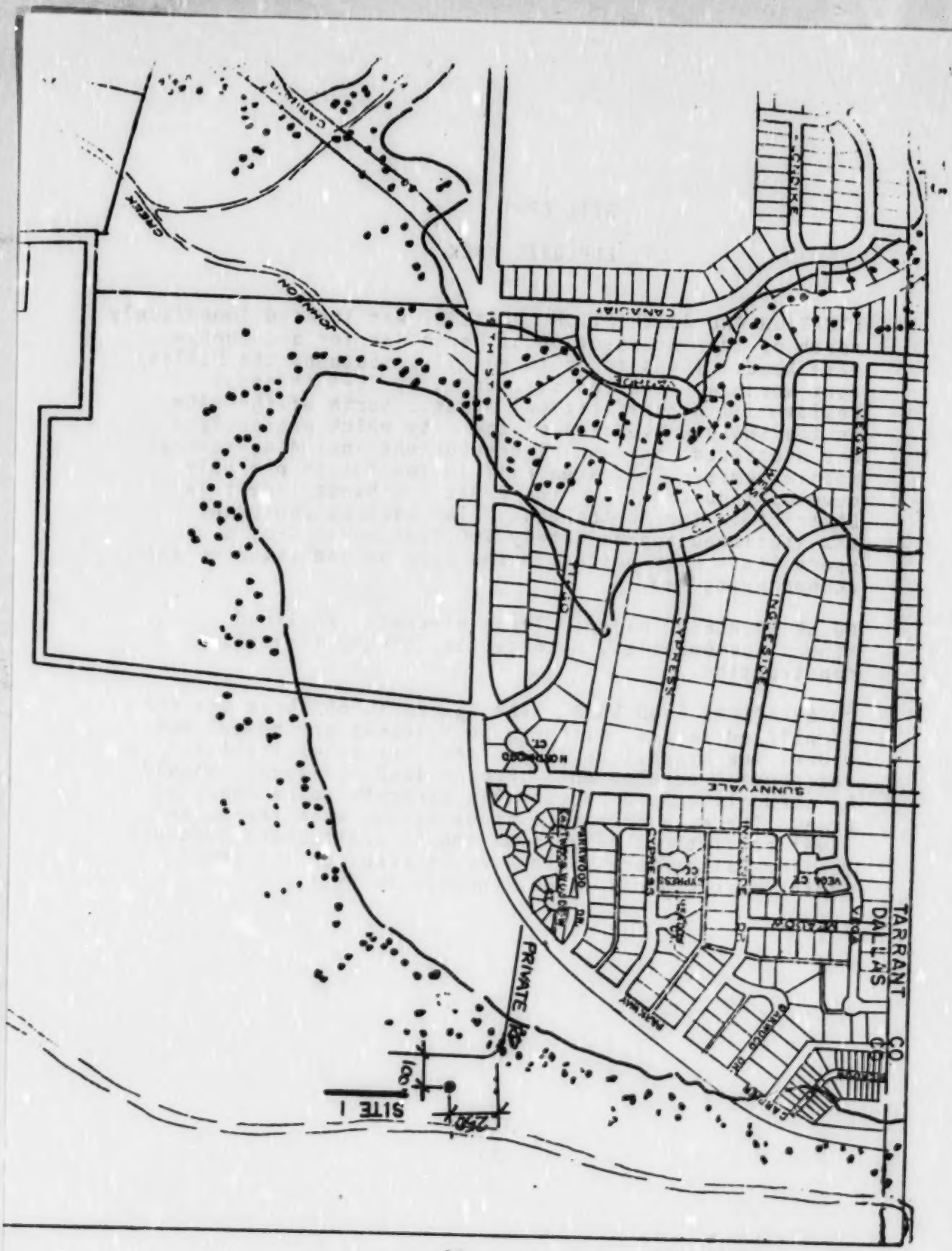
SITE GP-1

LTV EMPLOYEE PARK

LOCATION AND DESCRIPTION. Site #1 was located immediately north of the intersection of North Carrier and Sunnyvale Road. The site is three miles south of the Dallas/Fort Worth Airport and surrounded by SF-1 (highest residential classification) homes. North of the site is the Shady Grove area of the city which presently has scattered residential development including several mobile homes. This area will in the future probably develop industrially. The Great Southwest Industrial District is far to the east. The testing equipment was stationed approximately 100 feet north from a speed limit sign posted in the park as indicated on the accompanying map.

NOISE SOURCES. Major: large aircraft, railroad. Minor: automobiles, motorcycles, birds, insects, construction.

OBSERVATIONS FROM DATA. The L_{dn} is 10 dB above the EPA identified level. Although peak levels are 80 dBA and under, the overall daily averages are excessive for residential development. Proper land use zoning should be strongly considered in this aircraft noise impacted area. The data from this study agrees with the noise level predictions taken from the Aircraft Sound Exposure Map for Dallas/Fort Worth Airport prepared for the North Texas Council of Governments in 1971.


CANADIAN
CREEK
NORMAN
SUNNYVALE
PRIVATE
TARRANT CO
DALLAS CO
SITE 1
100'
250'

HOURLY "HAND-HELD METER" NOISE DATA AT GP-1

APRIL 19, 1974

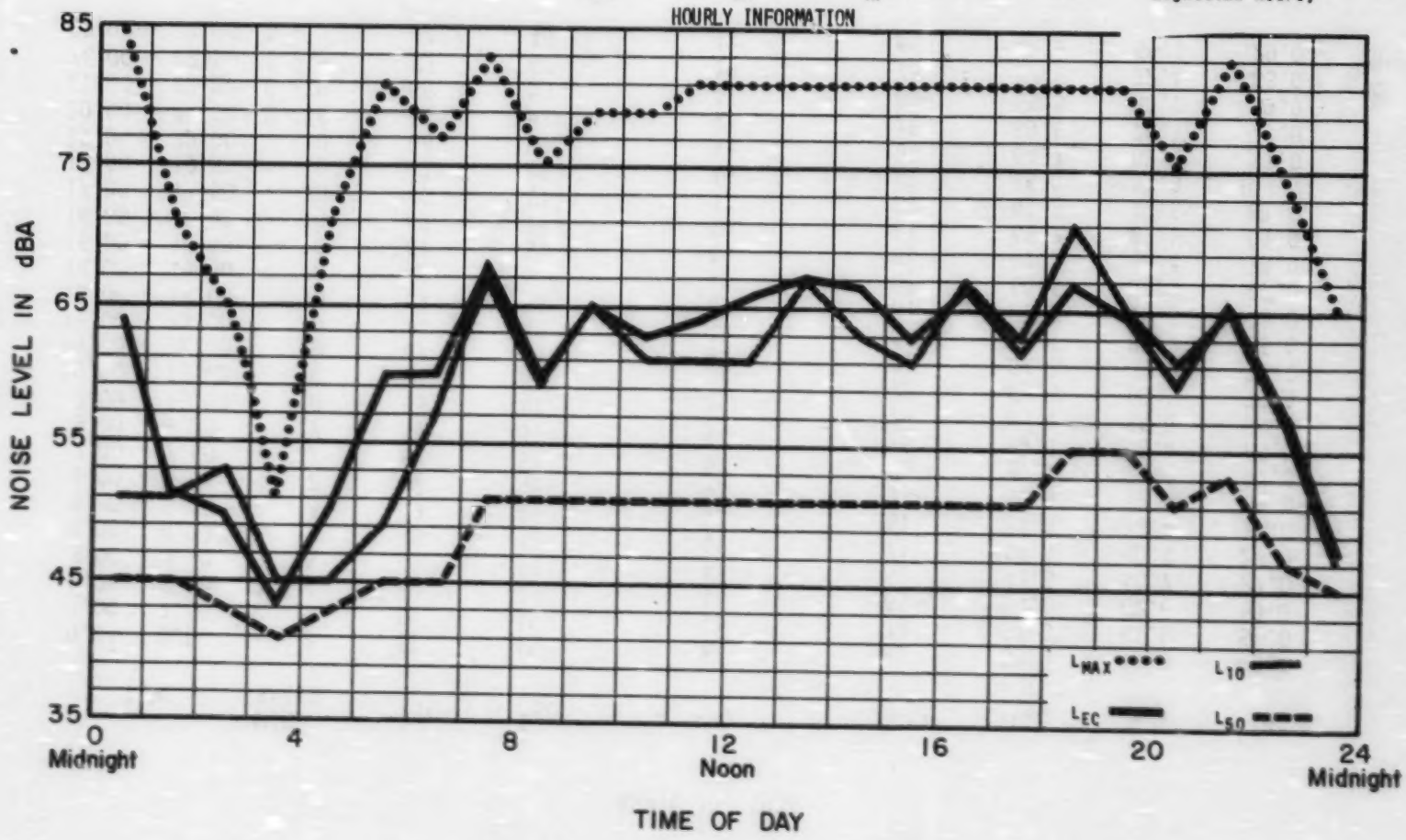
TIME	WIND SPEED	L_{10}	L_{50}	L_{90}	L_{max}	L_{eq}	L_{np}	TNI
0.01 - 0.50	2	51	45	43	85	63.9	79.8	45.0
1.00 - 1.50	2 - 4	51	45	41	71	51.3	61.8	51.0
2.00 - 2.50	2 - 4	53	43	41	65	50.1	62.6	59.0
3.00 - 3.50	6	45	41	41	51	43.3	48.7	27.0
4.00 - 4.50	2	45	43	41	71	50.4	60.4	27.0
5.00 - 5.50	2	49	45	43	81	59.8	73.4	37.0
6.00 - 6.55	2	57	45	43	77	59.9	77.4	69.0
7.00 - 7.50	2 - 7	67	51	47	83	67.8	90.4	97.0
8.00 - 9.00	7	59	51	47	75	59.4	73.4	65.0
9.00 - 10.00	10	65	51	47	79	65.0	84.6	89.0
10.00 - 11.00	7 - 10	61	51	45	79	62.8	80.3	79.0
11.00 - 12.00	10	61	51	45	81	64.3	82.8	79.0
12.00 - 13.00	10	61	49	43	81	66.1	87.2	85.0
13.00 - 14.00	10	67	51	45	81	67.2	90.6	103.0
14.00 - 15.00	10	63	51	45	81	66.6	87.3	87.0
15.00 - 16.00	10	61	51	45	81	62.7	80.4	79.0
16.00 - 16.45	10	67	51	49	81	66.7	87.5	91.0
17.00 - 17.50	10	63	51	47	81	61.8	77.5	81.0
18.00 - 18.50	10	71	55	49	81	66.9	87.3	107.0
19.00 - 20.00	10	65	55	49	81	64.7	82.1	83.0
20.00 - 20.50	8 - 16	61	51	47	75	59.5	75.1	73.0
21.00 - 22.00	6 - 10	65	53	47	83	65.5	85.0	89.0
22.00 - 22.50	5 - 7	57	47	45	75	57.2	72.4	63.0
23.00 - 24.00	5 - 7	47	45	43	65	47.7	55.1	29.0

SUMMARY OF NOISE LEVELS AT GP-1 FOR APRIL 19, 1974

DAILY INFORMATION: L_{MAX} = 85 L_{10} = 61 L_{50} = 49 L_{90} = 43

L_{EQ} = 63.5 L_{DN} = 65.1 L_{NP} = 83.7 TNI = 85.0

(Based on 15 daytime and 9 nighttime hours)



HOURLY "HAND-HELD METER" NOISE DATA AT GP-1

APRIL 20, 1974

TIME	WIND SPEED	L_{10}	L_{50}	L_{90}	L_{max}	L_{eq}	L_{np}	TNI
0.00 - 0.50	7	55	49	43	73	57.8	73.4	61.0
1.00 - 1.50	10	51	47	45	61	49.8	59.1	39.0
2.00 - 2.55	10	51	45	43	59	47.9	56.5	45.0
3.00 - 3.50	10	49	43	41	55	45.6	53.5	43.0
4.00 - 4.50	9	51	45	41	75	56.7	70.8	51.0
5.00 - 5.50	9	49	45	43	71	52.2	62.6	37.0
6.00 - 6.50	9	51	45	43	67	50.8	61.3	45.0
7.00 - 7.50	9	61	45	43	75	58.6	76.1	85.0
8.00 - 9.00	7	63	51	45	75	61.3	80.2	87.0

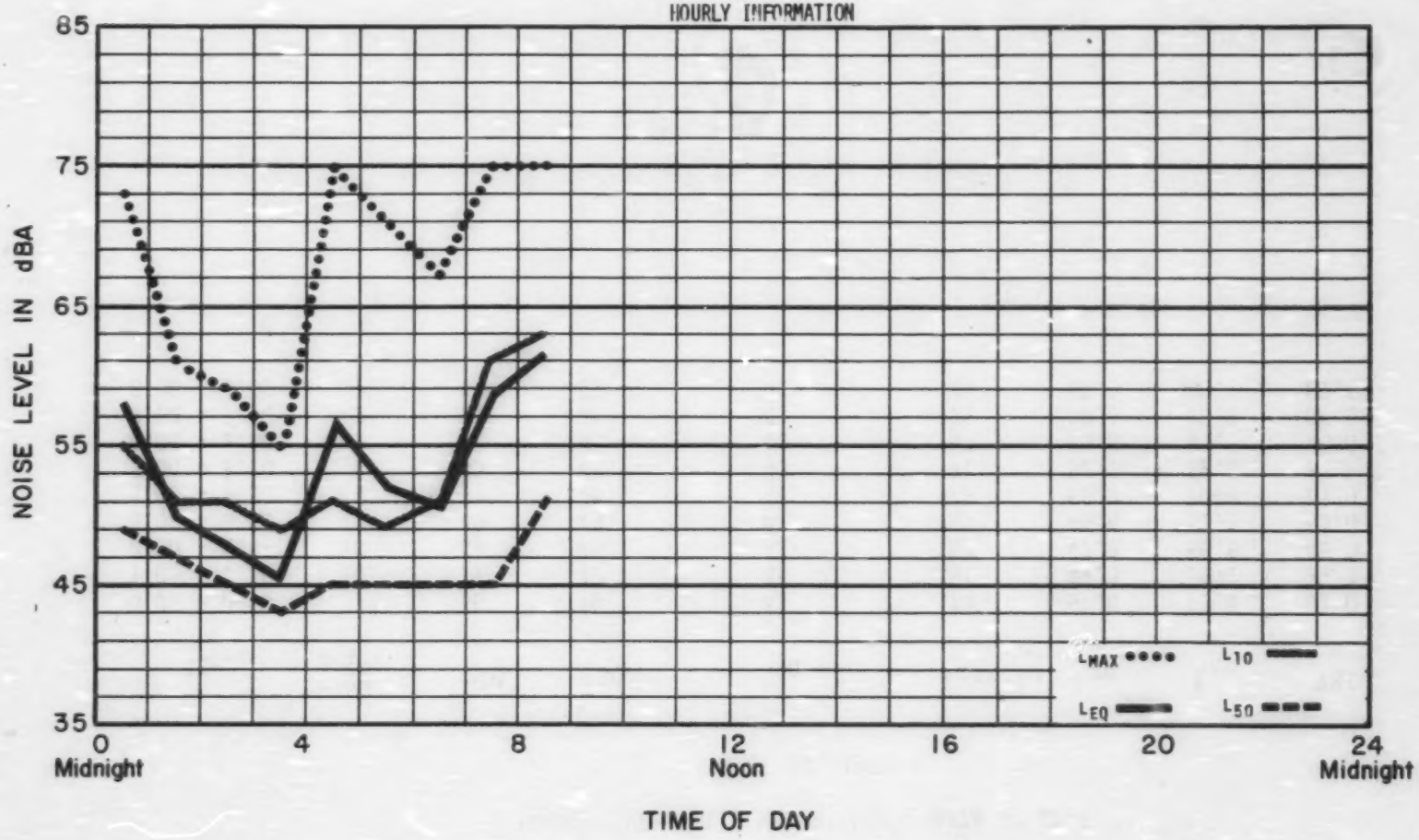
SUMMARY OF NOISE LEVELS AT GP-1 FOR APRIL 20, 1974

DAILY INFORMATION: L_{MAX} = 75 L_{10} = 55 L_{50} = 45 L_{90} = 43

L_{EQ} = 56.2 L_{DN} = 62.9 L_{NP} = 71.0 TNI = 61.0

(Based on 2 daytime and 7 nighttime hours)

HOURLY INFORMATION



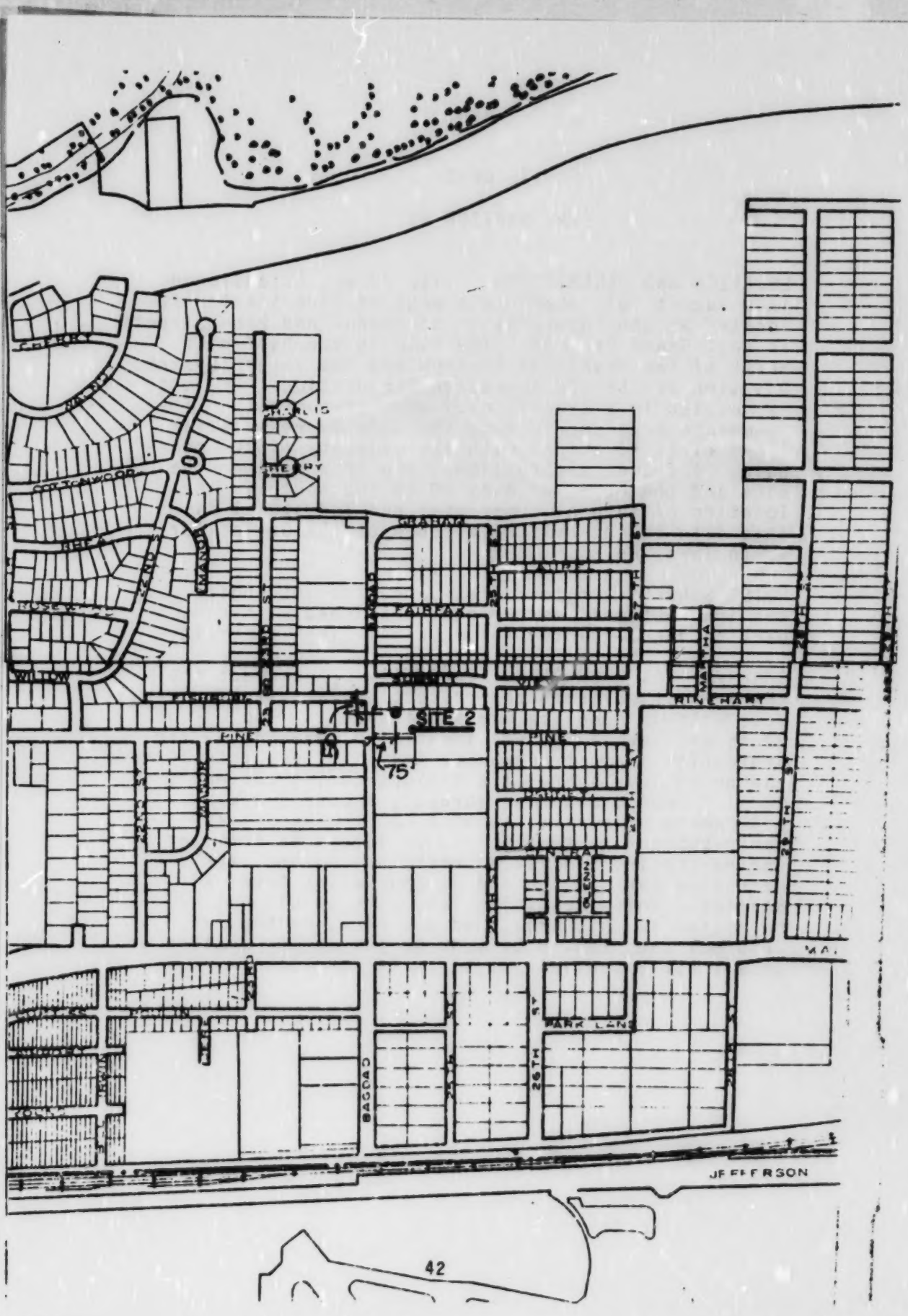
SITE GP-2

FIRE STATION #2

LOCATION AND DESCRIPTION. Site #2 was established in a vacant lot immediately east of Fire Station #2 located at the intersection of Bagdad and Pine Streets in east Grand Prairie. The site is one-half mile north of the Naval Air Station and the Vought Systems Division of the LTV Aerospace Corporation. The site is located in a transitional area of the city. The immediate area surrounding the site is residential (SF-4 classification) with the majority of the homes being of frame construction. The area between the site and the U. S. Highway 80 to the south is the location of several commercial and industrial firms. This site is one-half mile south of the Dallas/Fort Worth Turnpike.

NOISE SOURCES. Major: jet aircraft, jet engine testing, automobiles. Minor: railroad, insects, barking dogs, trucks, motorcycles, light aircraft.

OBSERVATIONS FROM DATA. The daily L_{eq} exceeds the EPA identified level for protection against hearing loss with an adequate margin of safety. The L_{dn} of 72 is well above the EPA identified level of 55 for protection against communication and sleep interference. The noise levels are at a minimum during the early morning hours, but rise abruptly around 7 a.m. and remain high until about 11 p.m. The primary contributions to the high noise levels is from jet engine testing and jet aircraft operations at LTV Aerospace Corporation and at the Dallas Naval Air Station. Noise sensitive land uses should not be permitted in this area, and a curfew, perhaps an informal one, should be made on jet engine testing and on all but essential jet aircraft operations.


SITE 2
75
PINE
FAIRFAX
BAGDAD
26TH
PARK LANE
JEFFERSON
42

HOURLY "HAND-HELD METER" NOISE DATA AT GP-2

APRIL 19, 1974

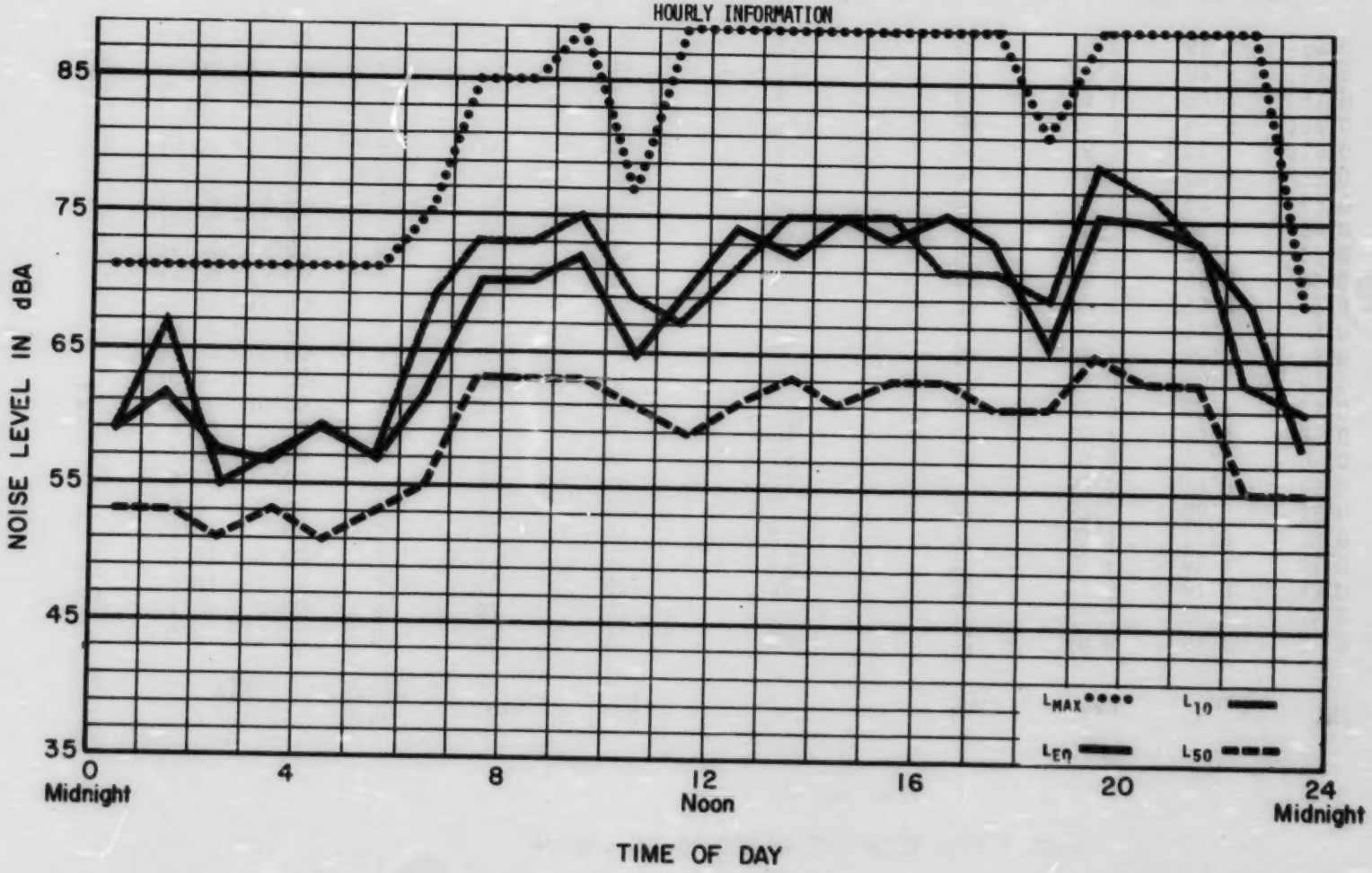
TIME	WIND SPEED	L_{10}	L_{50}	L_{90}	L_{max}	L_{eq}	L_{np}	TNI
0.01 - 1.00	0	59	53	53	71	58.8	69.2	47.0
1.01 - 2.00	4	67	53	51	71	61.5	76.1	85.0
2.01 - 3.00	3	55	51	49	71	57.3	67.3	43.0
3.01 - 4.00	3	57	53	51	71	56.6	65.4	45.0
4.01 - 5.00	2	59	51	49	71	59.1	72.7	59.0
5.01 - 6.00	0	57	53	51	71	57.3	66.3	45.0
6.00 - 7.00	0	67	55	51	75	62.2	77.0	85.0
7.00 - 8.00	2	73	63	59	85	70.0	84.7	85.0
8.00 - 9.00	2	73	63	59	85	70.4	85.4	85.0
9.00 - 10.00	3	75	63	59	89	72.0	88.6	93.0
10.00 - 11.00	4	69	61	51	77	64.9	78.4	81.0
11.00 - 12.00	4	67	59	53	89	69.1	85.7	79.0
12.00 - 13.00	4	71	61	55	89	74.2	93.7	89.0
13.00 - 14.00	3	75	63	57	89	72.5	90.2	99.0
14.00 - 15.00	4	75	61	57	89	75.0	95.2	99.0
15.00 - 16.00	4	75	63	57	89	73.3	92.1	99.0
16.00 - 17.00	4	71	63	55	89	75.2	94.7	89.0
17.00 - 18.00	4	71	61	57	89	73.2	90.9	83.0
18.00 - 19.00	4	69	61	57	81	65.7	78.6	75.0
19.00 - 20.00	8	79	65	57	89	75.2	96.1	115.0
20.00 - 21.00	10	77	63	57	89	74.9	95.5	107.0
21.00 - 22.00	3	73	63	57	89	73.1	90.9	91.0
22.00 - 23.00	4	63	55	53	89	68.9	82.8	63.0
23.00 - 24.00	4	61	55	53	69	58.2	67.4	55.0

SUMMARY OF NOISE LEVELS AT GP-2 FOR APPIL 19, 1974

DAILY INFORMATION: L_{MAX} = 89 L_{10} = 71 L_{50} = 59 L_{90} = 51

L_{EQ} = 71.1 L_{DN} = 71.9 L_{NP} = 90.8 TNI = 101.0

(Based on 15 daytime and 9 nighttime hours)



HOURLY "HAND-HELD METER" NOISE DATA AT GP-2

APRIL 20, 1974

TIME	WIND SPEED	L_{10}	L_{50}	L_{90}	L_{max}	L_{eq}	L_{np}	TNI
0.01 - 1.00	10	65	57	51	71	60.7	72.7	77.0
1.00 - 2.00	10	71	57	51	71	63.9	80.8	101.0
2.00 - 3.00	15	67	55	51	73	61.9	77.3	85.0
3.00 - 4.00	5	61	53	49	67	57.3	69.7	67.0
4.00 - 5.00	5	65	53	51	71	60.8	74.8	77.0
5.00 - 6.00	18	69	55	51	75	62.5	77.9	93.0
6.00 - 7.00	10	63	57	53	69	59.6	69.5	63.0
7.00 - 8.00	2	67	59	55	77	63.3	74.8	73.0
8.00 - 9.00	4	77	65	57	89	73.1	91.8	107.0
9.00 -10.00	8	73	63	57	89	71.5	87.6	91.0
10.00 -11.00	10	71	63	57	89	71.1	86.1	83.0
11.00 - 12.00	10	71	61	55	89	72.7	89.8	89.0
12.00 - 13.00	10	71	63	57	89	69.1	82.9	83.0
13.00 - 14.00	5	75	63	57	89	73.8	92.6	99.0
14.00 - 15.00	4	79	65	59	89	75.7	95.1	109.0
15.00 - 16.00	4	83	65	57	89	78.0	101.6	131.0
16.00 - 17.00	3	75	63	57	89	72.3	89.6	99.0
17.00 - 18.00	10	71	61	55	89	75.4	96.4	89.0
18.00 - 19.00	10	75	59	55	89	75.0	96.5	105.0
19.00 - 20.00	5	69	59	55	89	71.5	87.5	81.0
20.00 - 21.00	6	67	59	55	89	69.6	84.7	73.0
21.00 - 22.00	high	63	57	53	89	68.9	83.2	63.0

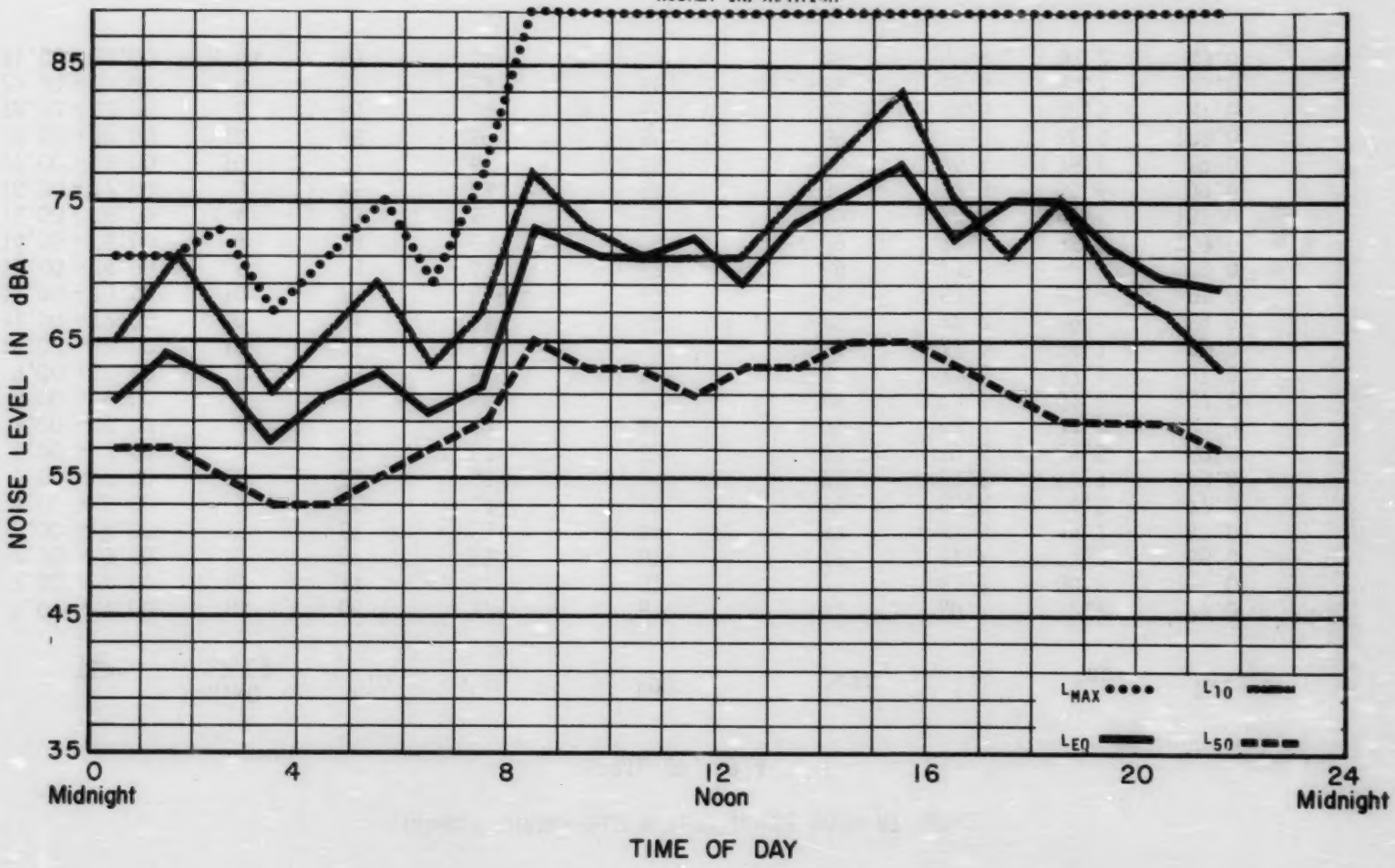
SUMMARY OF NOISE LEVELS AT GP-2 FOR APRIL 20, 1974

DAILY INFORMATION: L_{MAX} = 89 L_{10} = 71 L_{50} = 59 L_{90} = 53

L_{EQ} = 71.6 L_{DN} = 72.7 L_{NP} = 90.6 TNI = 95.0

(Based on 15 daytime and 7 nighttime hours)

HOURLY INFORMATION



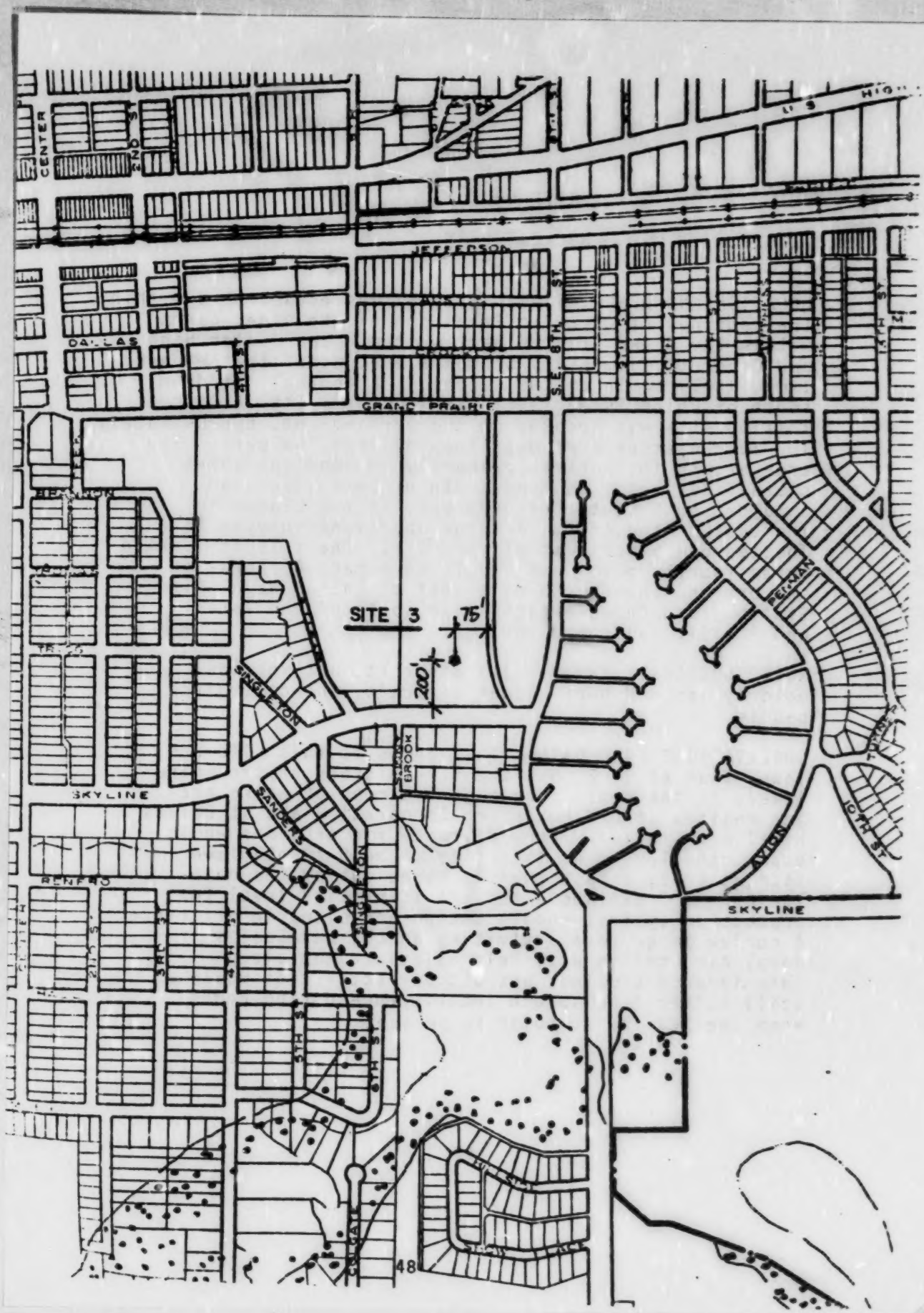
SITE GP-3

CROCKETT PARK

LOCATION AND DESCRIPTION. Site #3 was established within the confines of Crockett Park, one of the older parks within the Grand Prairie park system. Lee Junior High and Crockett Elementary School are adjacent to the park. Immediately south of the school is a football stadium, south of which is a gravel parking lot. The actual testing site was located on the parking lot, approximately 100 feet east of a roadway leading into the park. The area around the park is primarily residential (SF-4 classification). Southeast 8th or Belt Line Road, a major north-south thoroughfare, is two blocks to the east of the site. A large apartment complex is located one block east of the site. The site is located three-fourths mile west of LTV Aerospace Corporation, and one and one-fourth mile west of Dallas Naval Air Station, and three-eighths mile south of the Texas and Pacific railroad line.

NOISE SOURCES. Major: jet aircraft, automobiles, motorcycles. Minor: light aircraft, insects, birds, people.

OBSERVATIONS FROM DATA. The levels at this site are lower than at GP-2, but the time history of the noise levels is the same. The major sources of noise are jet engines at LTV Aerospace Corporation and at Dallas Naval Air Station. From distance factors, one would expect the levels at this site to be 8-10 dBA lower than at GP-2, a fact that is borne out by the data. The L_{dn} is 7 dBA above the EPA identified level for protection against communication and sleep interference. A curfew on certain activities at LTV and Dallas Naval Air Station will help alleviate the sleep interference problem, but outdoor activities would still suffer from speech interference during hours when the jet engine noise is present.


CENTER
JEFFERSON
DALLAS
GRAND PRAIRIE
SITE 3
75'
200'
SINGLETON
SKYLINE
SANDERS
BENFRO
SKYLINE
48

HOURLY "HAND-HELD METER" NOISE DATA AT GP-3

APRIL 19, 1974

TIME	WIND SPEED	L_{10}	L_{50}	L_{90}	L_{max}	L_{eq}	L_{np}	TNI
0.01 - 0.51	0	53	45	43	73	54.5	67.3	53.0
1.00 - 1.50	3	47	45	43	65	47.8	55.5	29.0
2.00 - 2.50	5 -10	49	45	43	67	47.9	55.7	37.0
3.00 - 3.50	10 -15	51	45	41	55	46.9	55.4	51.0
4.00 - 4.50	10 - 20	49	45	43	55	46.1	52.4	37.0
5.00 - 5.50	10 -15	51	45	45	51	46.8	52.5	39.0
6.15 - 6.50	10 - 15	57	51	51	73	56.0	64.8	45.0
7.00 - 7.45	10	65	55	53	75	61.2	73.9	71.0
8.00 - 8.50	5 -15	61	47	43	81	62.6	82.5	85.0
9.00 - 9.50	5 - 10	61	49	43	71	57.5	75.4	85.0
10.00 - 11.00	5 - 10	71	57	45	81	68.1	95.2	119.0
11.10 - 12.00	0 - 10	61	51	43	71	57.6	75.3	85.0
12.10 - 13.00	0 - 9	61	49	43	71	56.2	72.9	85.0
13.00 - 14.00	0 - 10	61	51	45	71	60.8	81.7	79.0
14.00 - 15.00	0 - 10	61	51	45	81	61.2	79.9	79.0
15.10 - 16.00	5 - 10	59	49	43	81	59.7	77.5	77.0
16.00 - 17.00	4 - 7	63	55	51	75	61.0	74.4	69.0
17.00 -18.00	5 - 9	63	55	51	75	61.1	73.7	69.0
18.00 - 19.00	5 - 8	57	53	49	73	57.6	68.3	51.0
19.00 - 19.50	6 - 9	59	51	49	69	55.9	66.8	59.0
20.00 - 20.50	very gusty	61	53	49	79	62.0	77.3	67.0
21.00 - 21.50	3 - 4	59	53	49	71	56.8	68.4	59.0
22.00 - 22.50	3 - 4	55	49	47	71	55.9	68.0	49.0
23.00 - 23.45	gusty	51	47	45	57	49.3	56.2	39.0

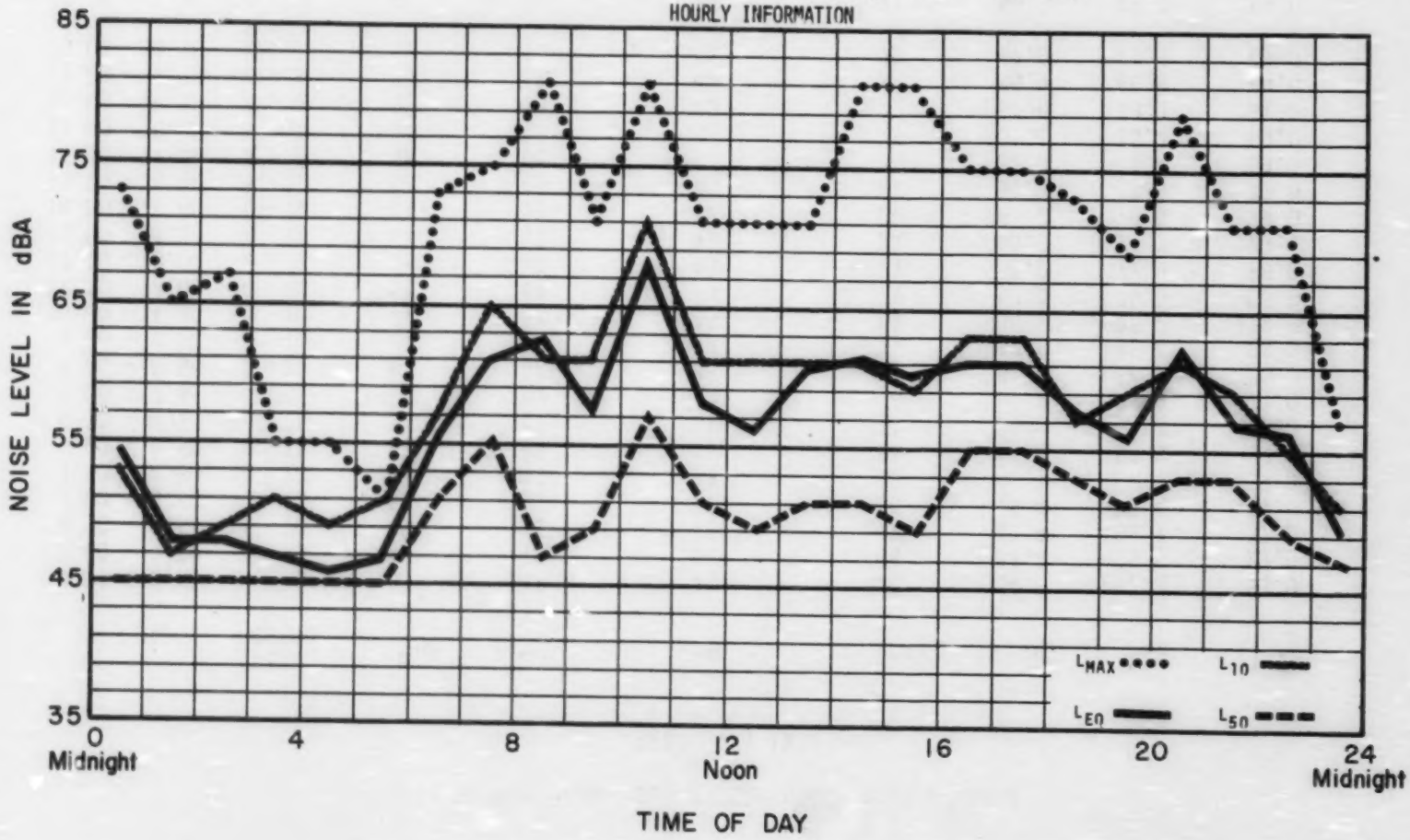
SUMMARY OF NOISE LEVELS AT GP-3 FOR APRIL 19, 1974

DAILY INFORMATION: L_{MAX} = 81 L_{10} = 61 L_{50} = 51 L_{90} = 43

L_{EQ} = 59.7 L_{DN} = 61.5 L_{NP} = 77.2 TNI = 85.0

(Based on 15 daytime and 9 nighttime hours)

HOURLY INFORMATION



HOURLY "HAND-HELD METER" NOISE DATA AT GP-3

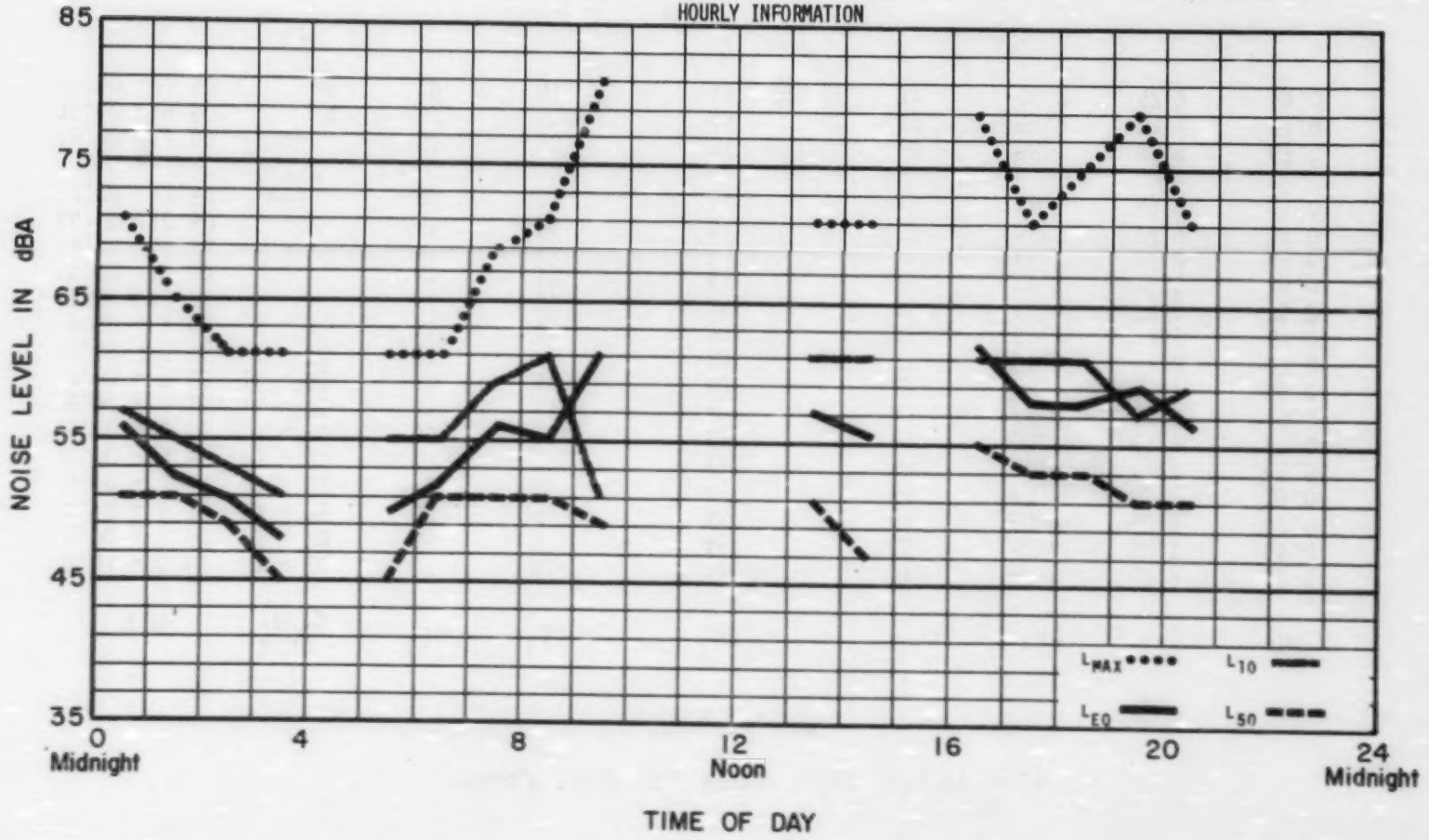
APRIL 20, 1974

TIME	WIND SPEED	L_{10}	L_{50}	L_{90}	L_{max}	L_{eq}	L_{np}	TNI
0.01 - 0.55	10 - 20	57	51	47	71	55.8	67.9	57.0
1.00 - 1.50	10 - 20	55	51	45	65	52.6	62.5	55.0
2.10 - 2.50	10 - 25	53	49	45	61	50.9	60.9	47.0
3.00 - 3.50	10 - 20	51	45	45	61	48.4	56.6	39.0
4.30 - 4.55	10 - 20	51	45	43	65	50.4	61.4	45.0
5.00 - 5.55	10 - 20	55	45	43	61	50.1	61.9	61.0
6.00 - 6.50	10 - 20	55	51	47	61	52.0	60.0	49.0
7.00 - 7.50	10 - 20	59	51	49	69	56.1	66.1	59.0
8.00 - 8.50	5 - 10	61	51	39	71	55.0	72.8	97.0
9.00 - 9.50	5 - 10	51	49	39	81	61.1	77.5	57.0
10.00 - 10.30	----	61	51	45	71	59.9	79.6	79.0
13.00 - 13.50	----	61	51	45	71	57.1	72.6	79.0
14.00 - 14.50	5 - 10	61	47	43	71	55.7	71.4	85.0
16.00 - 16.50	----	61	55	51	79	62.0	74.9	61.0
17.00 - 17.50	very gusty	61	53	51	71	58.1	69.3	61.0
18.00 - 18.50	----	61	53	51	75	58.1	68.9	61.0
19.00 - 19.50	4	57	51	49	79	59.2	70.1	51.0
20.00 - 20.50	4	59	51	49	71	56.7	67.7	59.0

SUMMARY OF NOISE LEVELS AT GP-3 FOR APRIL 20, 1974

DAILY INFORMATION: L_{MAX} = 81 L_{10} = 59 L_{50} = 51 L_{90} = 45

L_{EQ} =57.3 L_{DN} = 60.3 L_{NP} = 71.8 TNI = 71.0 (Based on 10 daytime and 7 nighttime hours)



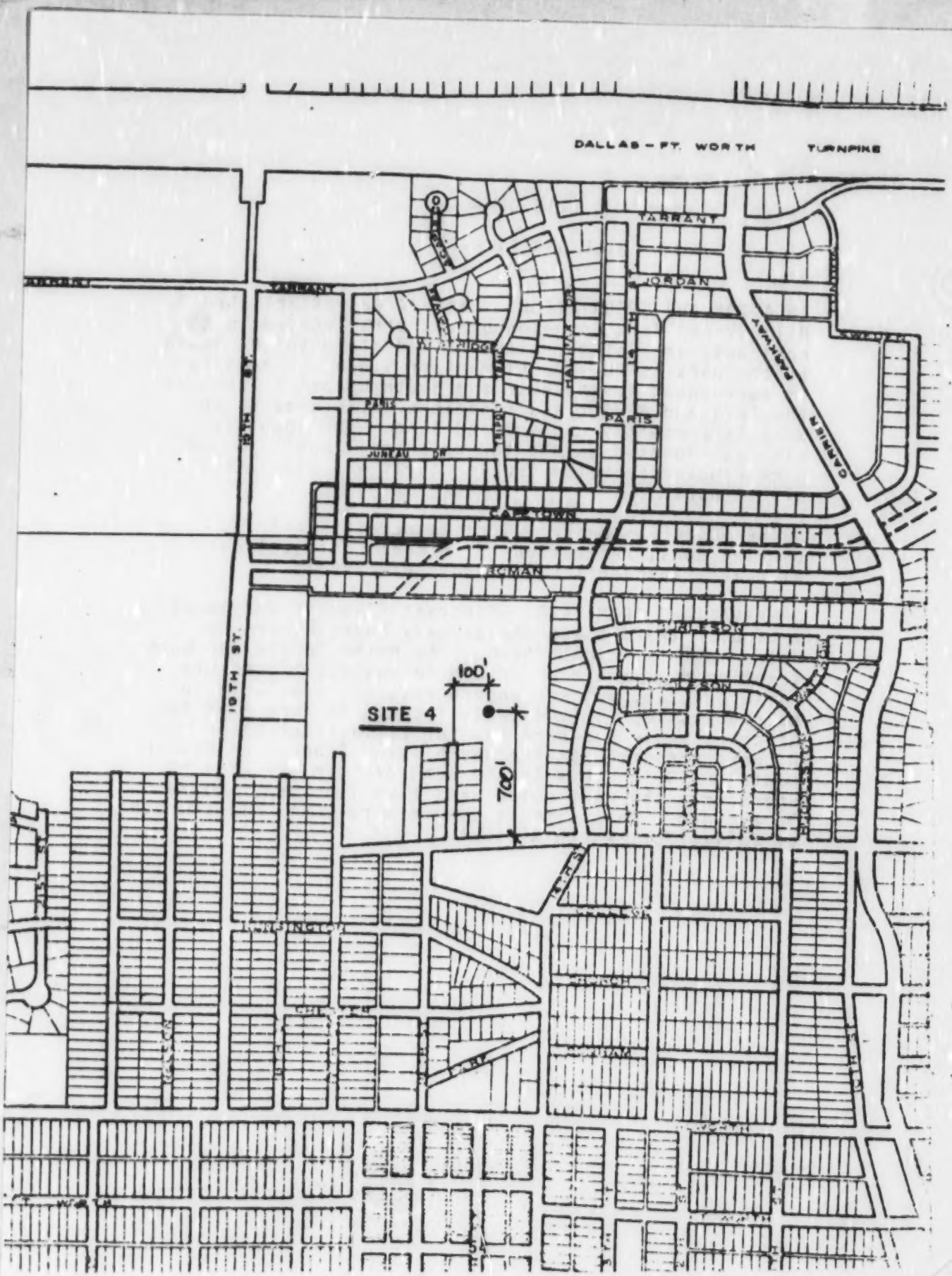
SITE GP-4

HILL STREET PARK

LOCATION AND DESCRIPTION. Site #4 was established in Hill Street Park, a neighborhood park located in the northwest area of the city. Immediately to the south of the park is Houston Elementary School. The site is surrounded to the east and south by brick homes in the SF-2 and SF-3 classifications. The area to the west is presently undeveloped land. The specific site was located on the top of a small knoll in the park removed from the tennis courts and play areas of the park.

NOISE SOURCES. Major: large aircraft, railroad, barking dogs, recreational. Minor: birds, light aircraft, automobiles, motorcycles, insects.

OBSERVATIONS FROM DATA. Aircraft flyovers and local vehicular traffic are the primary contributors to noise in this neighborhood. The noise levels for both sampling days are high enough to suggest a possible noise problem, but not enough data was available to be conclusive. This site is located in Zone A of the Aircraft Sound Exposure Map for Dallas/Fort Worth Airport prepared for the North Texas Council of Governments in 1971. This is the zone of "minimal effect" where only the most noise sensitive land uses should be avoided. This site is approximately six miles south of Dallas/Fort Worth Airport.


DALLAS - FT. WORTH TURNPIKE
TARRANT
JORDAN
PARKWAY
PARIS
JUNEAU DR
CARLTON
ECKMAN
JILESON
10TH ST
100'
SITE 4
700'

HOURLY "HAND-HELD METER" NOISE DATA AT GP-4

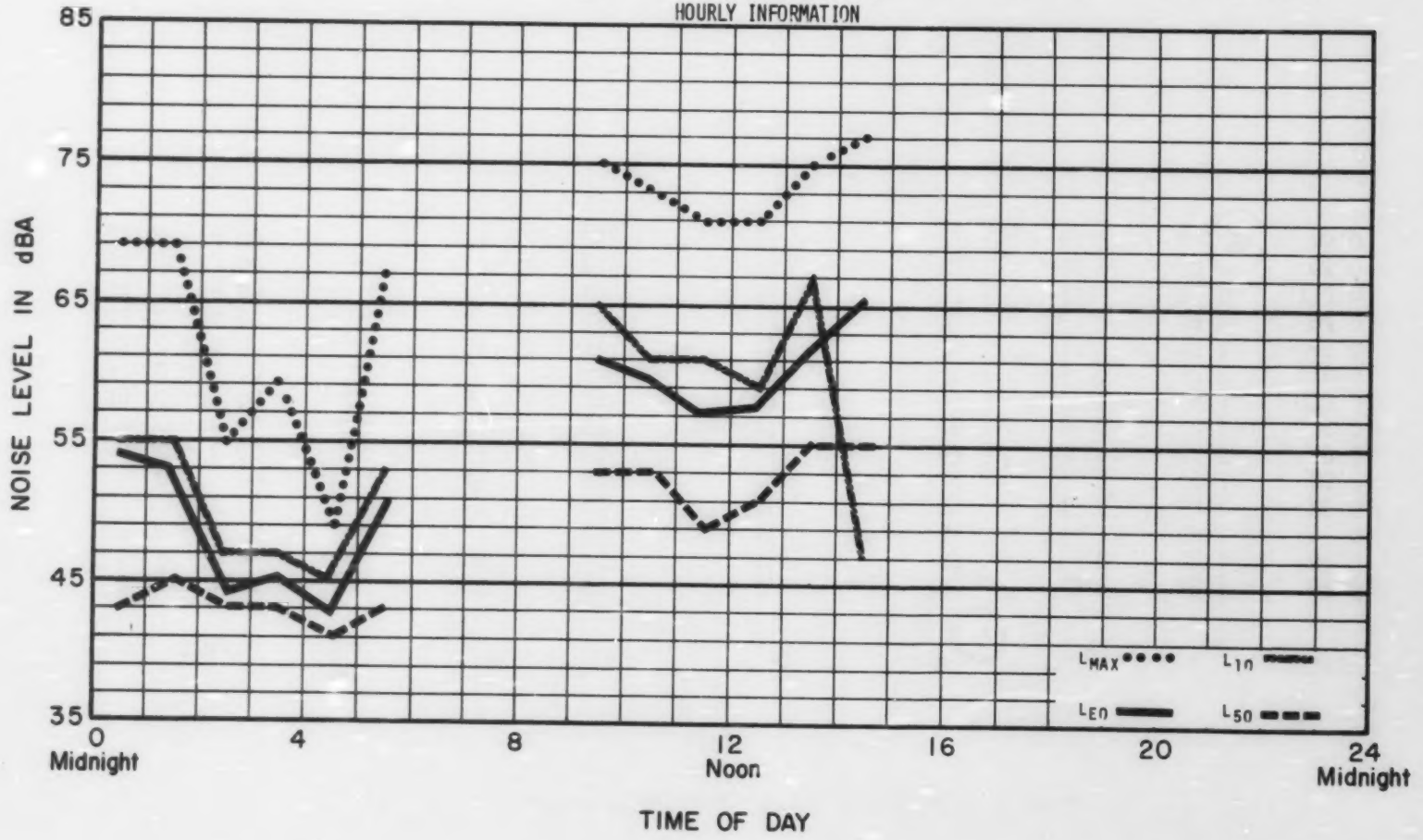
APRIL 19, 1974

TIME	WIND SPEED	L_{10}	L_{50}	L_{90}	L_{max}	L_{eq}	L_{np}	TNI
0.01 - 1.00	----	55	43	41	69	53.9	69.1	67.0
1.00 - 2.00	----	55	45	41	69	53.0	68.6	67.0
2.00 - 3.00	----	47	43	41	55	44.1	50.9	35.0
3.00 - 4.00	----	47	43	41	59	45.5	53.8	35.0
4.00 - 5.00	----	45	41	39	49	42.7	49.2	33.0
5.00 - 6.00	----	53	43	41	67	50.9	63.6	59.0
9.00 - 10.00	----	65	53	47	75	61.0	78.1	89.0
10.00 - 11.00	----	61	53	47	73	59.6	74.3	73.0
11.00 - 12.00	----	61	49	45	71	57.0	72.7	79.0
12.00 - 13.00	----	59	51	47	71	57.7	72.1	65.0
13.00 - 14.00	----	67	55	47	75	61.7	79.2	97.0
14.00 - 15.00	----	47	55	71	77	65.7	86.5	113.0
16.00 - 17.00	----	59	51	47	71	56.9	70.5	65.0
23.00 - 24.00	1	73	69	59	77	69.7	84.8	85.0

SUMMARY OF NOISE LEVELS AT GP-4 FOR APRIL 19, 1974

DAILY INFORMATION: L_{MAX} = 77 L_{10} = 61 L_{50} = 49 L_{90} = 41

L_{EQ} =60.1 L_{DN} = 66.5 L_{NP} = 80.8 TNI = 91.0 (Based on 7 daytime and 6 nighttime hours)



HOURLY "HAND-HELD METER" NOISE DATA AT GP-4

APRIL 20, 1974

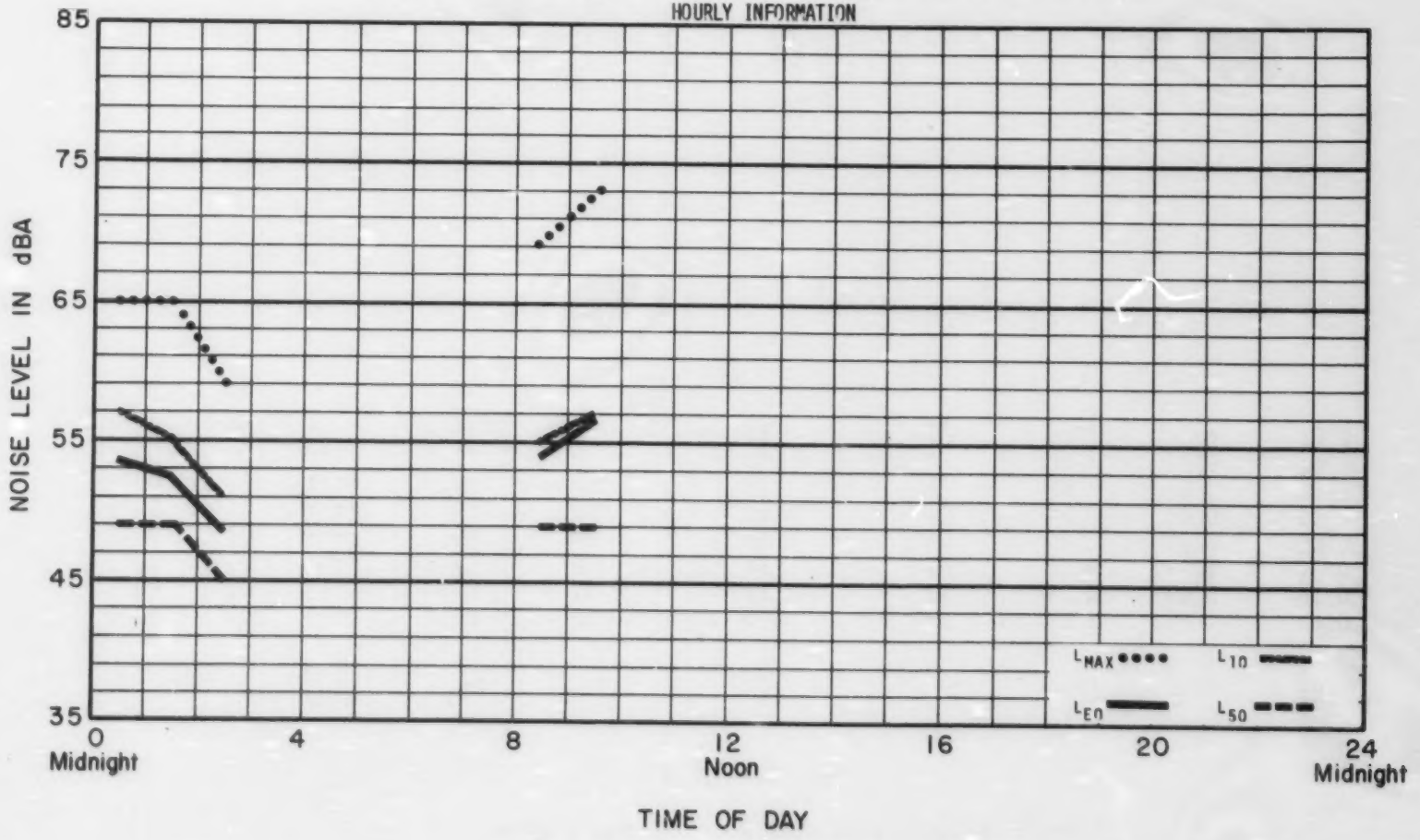
TIME	WIND SPEED	L_{10}	L_{50}	L_{90}	L_{max}	L_{eq}	L_{np}	TNI
0.00 - 1.00	----	57	49	45	65	53.7	66.4	63.0
1.00 - 2.00	strong	55	49	43	65	52.7	65.2	61.0
2.00 - 3.00	----	51	45	43	59	47.6	55.9	45.0
8.00 - 9.00	----	55	49	45	69	54.2	66.0	55.0
9.00 - 10.00	----	57	49	47	73	56.8	70.0	57.0
10.00 - 10.30	----	61	49	47	71	58.1	73.0	73.0
13.00 - 14.00	----	61	49	45	71	57.1	72.8	79.0
15.00 - 16.00	----	61	55	47	67	58.1	71.9	73.0

SUMMARY OF NOISE LEVELS AT GP-4 FOR APRIL 20, 1974

DAILY INFORMATION: L_{MAX} =73 L_{10} = 57 L_{50} = 49 L_{90} = 45

L_{EQ} = 55.1 L_{DN} = 59.8 L_{NP} = 68.8 TNI = 63.0

(Based on 5 daytime and 3 nighttime hours)



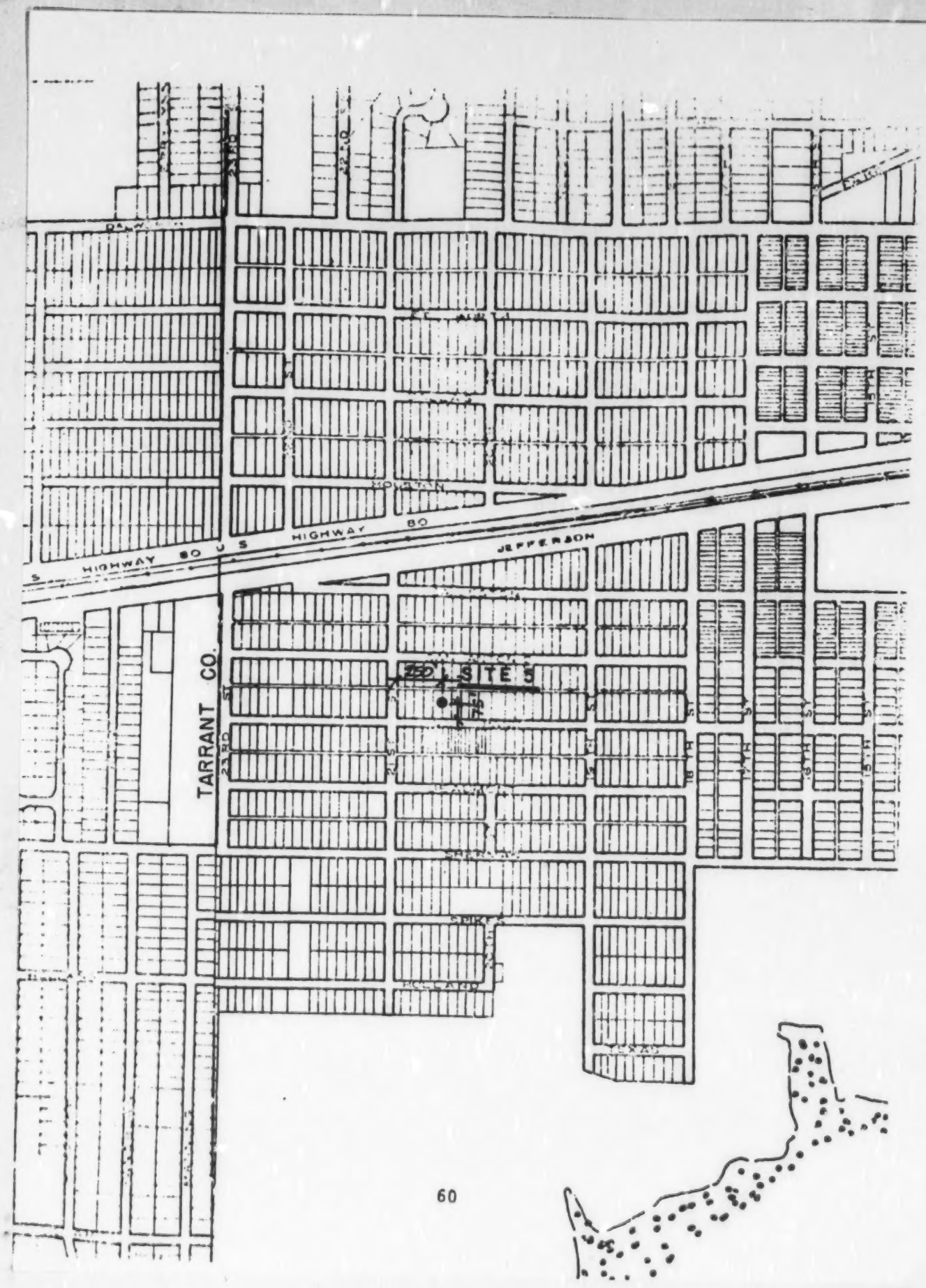
SITE GP-5

PEPPERMINT PARK

LOCATION AND DESCRIPTION. Site #5 was established in Peppermint Park located at the intersection of El Paso and Southwest 21st in the western area of Grand Prairie. The park is in the center of a MF-1 residential district with SF-4 and duplex areas nearby. Three blocks to the north of the site is Jefferson Street, a major east-west thoroughfare. Running parallel to Jefferson are the tracks of the Texas and Pacific Railroad Company on which trains pass through the city sixteen times daily. Some five blocks to the east is the National Guard Armory from which helicopter training flights are conducted.

NOISE SOURCES. Major: large aircraft, residential, barking dogs. Minor: railroad, light aircraft, trucks, automobiles, insects, birds.

OBSERVATIONS FROM DATA. The EPA identified noise level for protection against communication and sleep interference is exceeded by approximately 5 dBA, but this does not appear to be a major noise problem area. This site is five miles south of Dallas/Fort Worth Airport, and is located in Zone A of the Aircraft Sound Exposure Map prepared in 1971 for the North Texas Council of Governments. Zone A is called the "zone of minimal effect" and is suitable for residential development.


HIGHWAY 80 U S
HIGHWAY 80
JEFFERSON
TARRANT CO.
SITE 5

HOURLY "HAND-HELD METER" NOISE DATA AT GP-5

APRIL 19, 1974

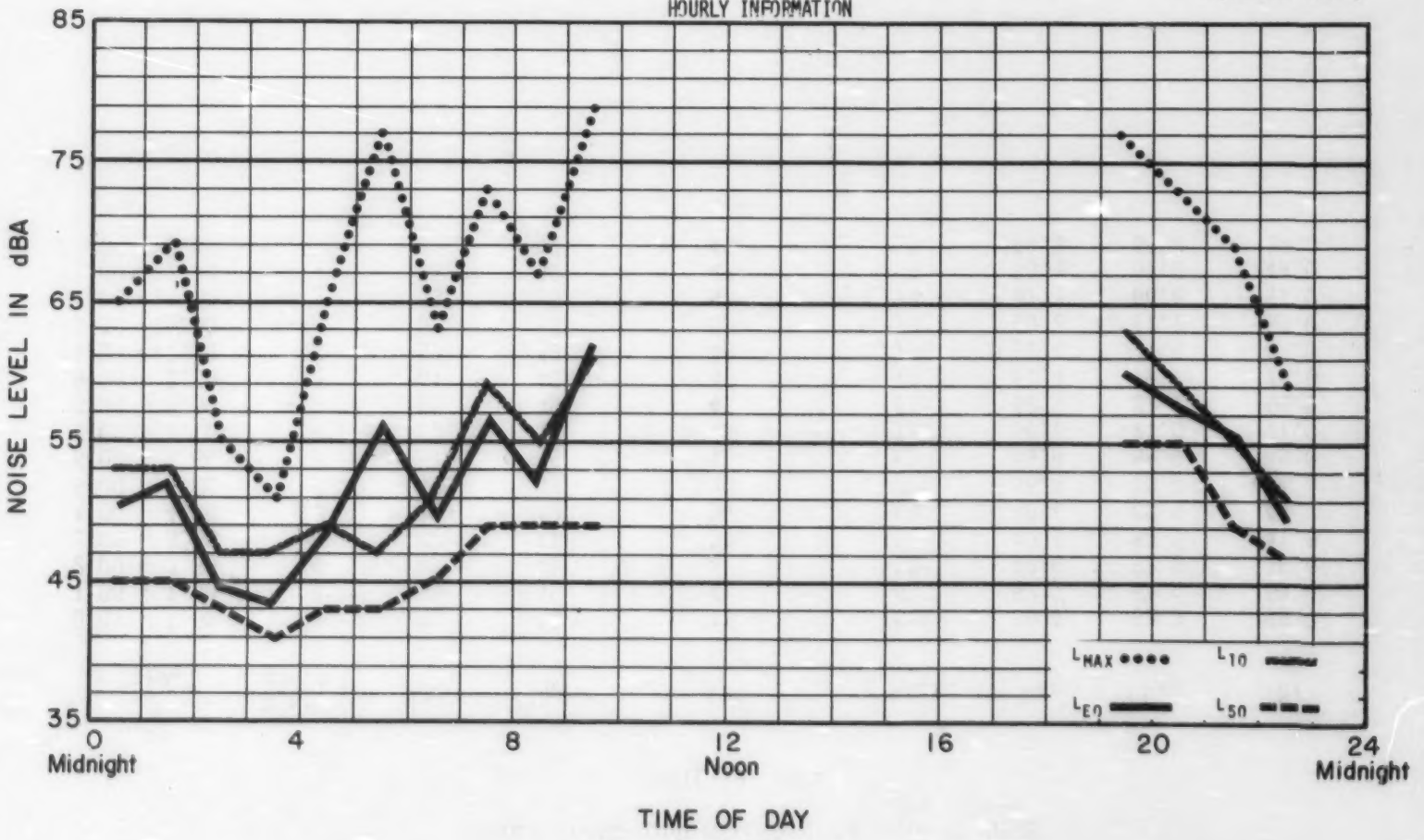
TIME	WIND SPEED	L_{10}	L_{50}	L_{90}	L_{max}	L_{eq}	L_{np}	TNI
0.01 - 1.00	7	53	45	41	65	50.7	63.3	59.0
1.00 - 1.50	5	53	45	41	69	52.1	66.0	59.0
2.00 - 2.50	4	47	43	41	55	44.6	52.0	35.0
3.00 - 3.50	8	47	41	39	51	43.5	50.5	41.0
4.00 - 4.50	11	49	43	39	65	48.6	60.5	49.0
5.00 - 6.00	7	47	43	39	77	56.4	70.4	41.0
6.00 - 6.50	7	51	45	43	63	49.4	58.9	45.0
7.00 - 7.50	9	59	49	45	73	56.5	71.0	71.0
8.00 - 8.50	----	55	49	45	67	52.1	62.2	55.0
9.00 - 9.50	12	61	49	45	79	61.4	79.7	79.0
11.00 - 11.50	12	57	49	45	75	57.1	71.5	63.0
19.00 - 20.00	----	63	55	53	77	60.3	71.7	63.0
20.00 - 21.00	----	59	55	51	73	57.3	66.8	53.0
21.00 - 22.00	----	55	49	47	69	55.3	67.0	49.0
22.00 - 23.00	----	51	47	45	59	49.5	56.8	39.0

SUMMARY OF NOISE LEVELS AT GP-5 FOR APRIL 19, 1974

DAILY INFORMATION: L_{MAX} = 79 L_{10} = 57 L_{50} = 47 L_{90} = 41

L_{EQ} = 55.7 L_{DN} = 59.9 L_{NP} = 71.6 TNI = 75.0 (Based on 6 daytime and 8 nighttime hours)

HOURLY INFORMATION



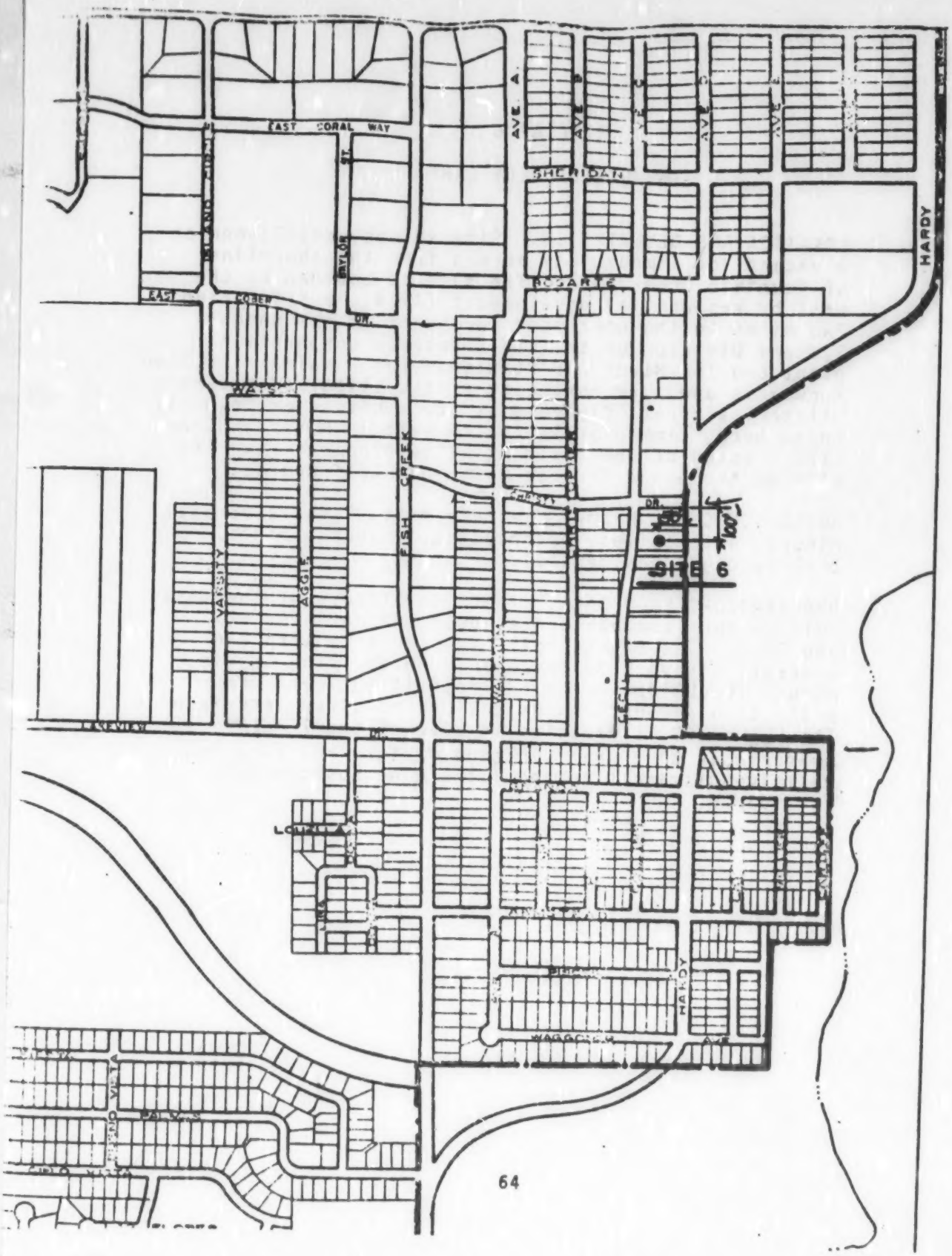
SITE GP-6

MOUNTAIN CREEK LAKE

LOCATION AND DESCRIPTION. Site #6 was established on a vacant lot immediately across from the shoreline of Mountain Creek Lake. The site is bounded to the west by residential development (SF-4 classification). Two miles to the north and northeast is the Vought Systems Division of the LTV Aerospace Corporation plant and the Naval Air Station. The Naval Air Station runway is one mile northeast of the site, and numerous military aircraft flyovers at low altitude are experienced here. Immediately to the east is Mountain Creek Lake. South of the residential development near the site is the Grand Prairie Municipal Golf Course.

NOISE SOURCES. Major: jet aircraft, light aircraft. Minor: automobiles, motorcycles, insects, birds, barking dogs, residential.

OBSERVATIONS FROM DATA. The time history of the data follows the same pattern as does the data for GP-2 and GP-3. Jet engine noise from both testing and aircraft flyovers is the main problem. The L_{dn} is almost 10 dBA above the EPA identified level for protection against communication and sleep interference. The L_{eq} of 63 is expected in view of the 71 dBA measured at GP-2 when distance factors relating the relative distances to the jet engine sources are considered.


EAST CORAL WAY
AVE. A
AVE. B
AVE. C
AVE. D
AVE. E
HARDY
BAYLOR ST.
EAST
ROBIN
DR.
WATSON
FISH CREEK
VARSITY
AGGIE
SITE 6
LAKEVIEW
LOUISIANA
WAGGONER
AVE.
CIRCLE VISTA
CIRCLE

HOURLY "HAND-HELD METER" NOISE DATA AT GP-6

APRIL 19, 1974

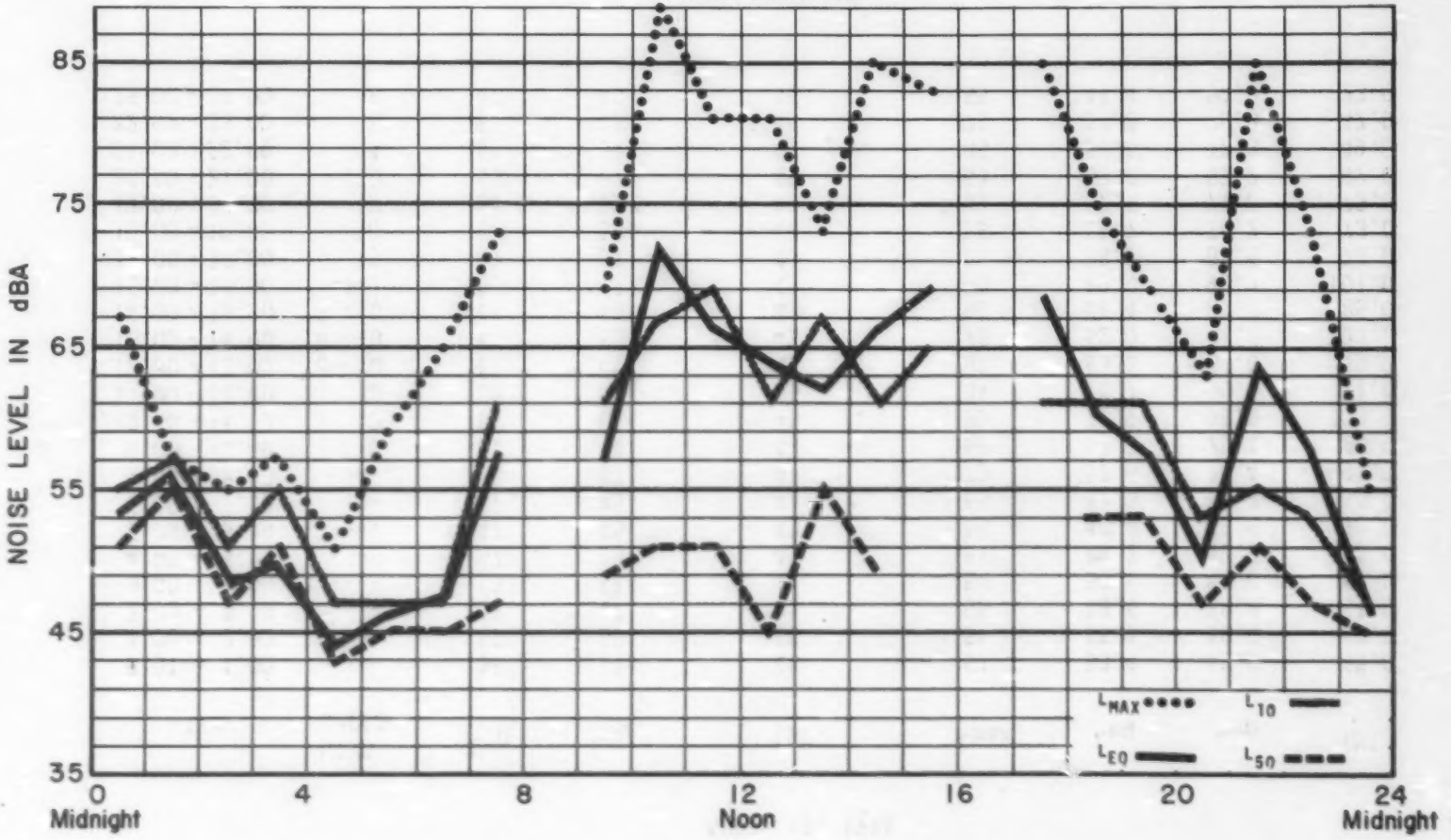
TIME	WIND SPEED	L_{10}	L_{50}	L_{90}	L_{max}	L_{eq}	L_{np}	TNI
0.01 - 1.00	----	55	51	45	67	53.4	65.5	55.0
1.00 - 2.00	----	57	55	55	57	55.9	58.4	33.0
2.00 - 3.00	----	51	47	41	55	48.5	58.8	51.0
3.00 - 4.00	----	55	51	41	57	50.5	66.0	67.0
4.00 - 5.00	----	47	43	41	51	44.2	49.3	35.0
5.00 - 6.00	----	47	45	43	59	46.8	53.6	29.0
6.00 - 7.00	----	47	45	41	65	47.5	56.7	35.0
7.00 - 8.00	----	61	47	41	73	57.6	76.4	91.0
9.00 -10.00	5	61	49	43	69	57.3	75.1	85.0
10.00 -11.00	9	67	51	45	89	71.9	96.2	103.0
11.00 - 12.00	9	69	51	45	81	66.7	90.6	111.0
12.00 - 13.00	8 - 10	61	45	45	81	63.8	82.6	79.0
13.00 - 14.00	8 - 10	67	55	45	73	62.0	81.4	103.0
14.00 - 15.00	3 - 5	61	49	43	85	66.4	87.2	85.0
15.00 - 16.00	----	65	47	43	83	69.0	93.9	101.0
17.00 - 18.00	19	61	51	47	85	68.9	87.6	73.0
18.00 - 19.00	10	61	53	47	75	59.7	74.2	73.0
19.00 - 20.00	12	61	53	47	69	57.5	71.6	73.0
20.00 - 21.00	10	53	47	45	63	50.2	59.2	47.0
21.00 - 22.00	4	55	51	47	85	63.5	77.3	49.0
22.00 - 23.00	5	53	47	45	73	57.2	70.8	47.0
23.00 - 24.00	8	47	45	45	55	46.4	50.2	23.0

SUMMARY OF NOISE LEVELS AT GP-6 FOR APRIL 19, 1974

DAILY INFORMATION: L_{MAX} = 89 L_{10} = 57 L_{50} = 49 L_{90} = 43

L_{EQ} = 63.1 L_{DN} = 64.4 L_{NP} = 80.8 TNI = 69.0 (Based on 12 daytime and 9 nighttime hours)

HOURLY INFORMATION



HOURLY "HAND-HELD METER" NOISE DATA AT GP-6

APRIL 20, 1974

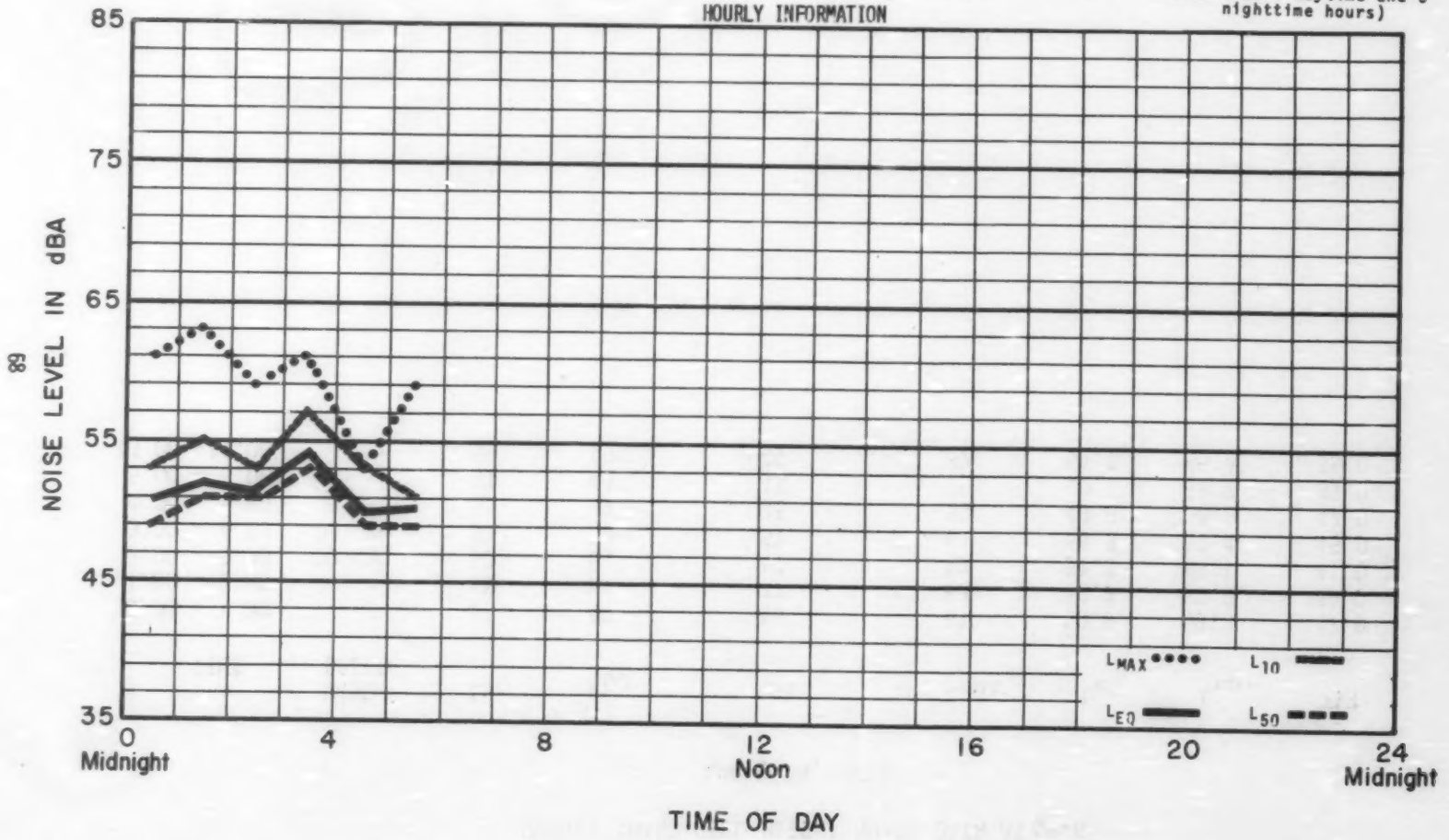
TIME	WIND SPEED	L_{10}	L_{50}	L_{90}	L_{max}	L_{eq}	L_{np}	TNI
0.00 - 1.00	-----	53	49	45	61	50.9	59.0	47.0
1.00 - 2.00	-----	55	51	47	63	52.3	59.8	49.0
2.00 - 3.00	20 - 30	53	51	47	59	51.3	59.1	41.0
3.00 - 4.00	20 - 25	57	53	51	61	54.3	60.4	45.0
4.00 - 4.50	10 - 12	53	49	45	53	49.8	56.8	47.0
5.00 - 6.00	8 - 12	51	49	45	59	50.5	58.2	39.0
13.00 - 14.00	6	59	49	49	67	54.8	65.4	59.0

SUMMARY OF NOISE LEVELS AT GP-6 FOR APRIL 20, 1974

DAILY INFORMATION: L_{MAX} = 67 L_{10} = 55 L_{50} = 51 L_{90} = 47

L_{EQ} = 52.4 L_{DN} = 61.2 L_{NP} = 61.3 TNI = 49.0

(Based on 1 daytime and 6 nighttime hours)



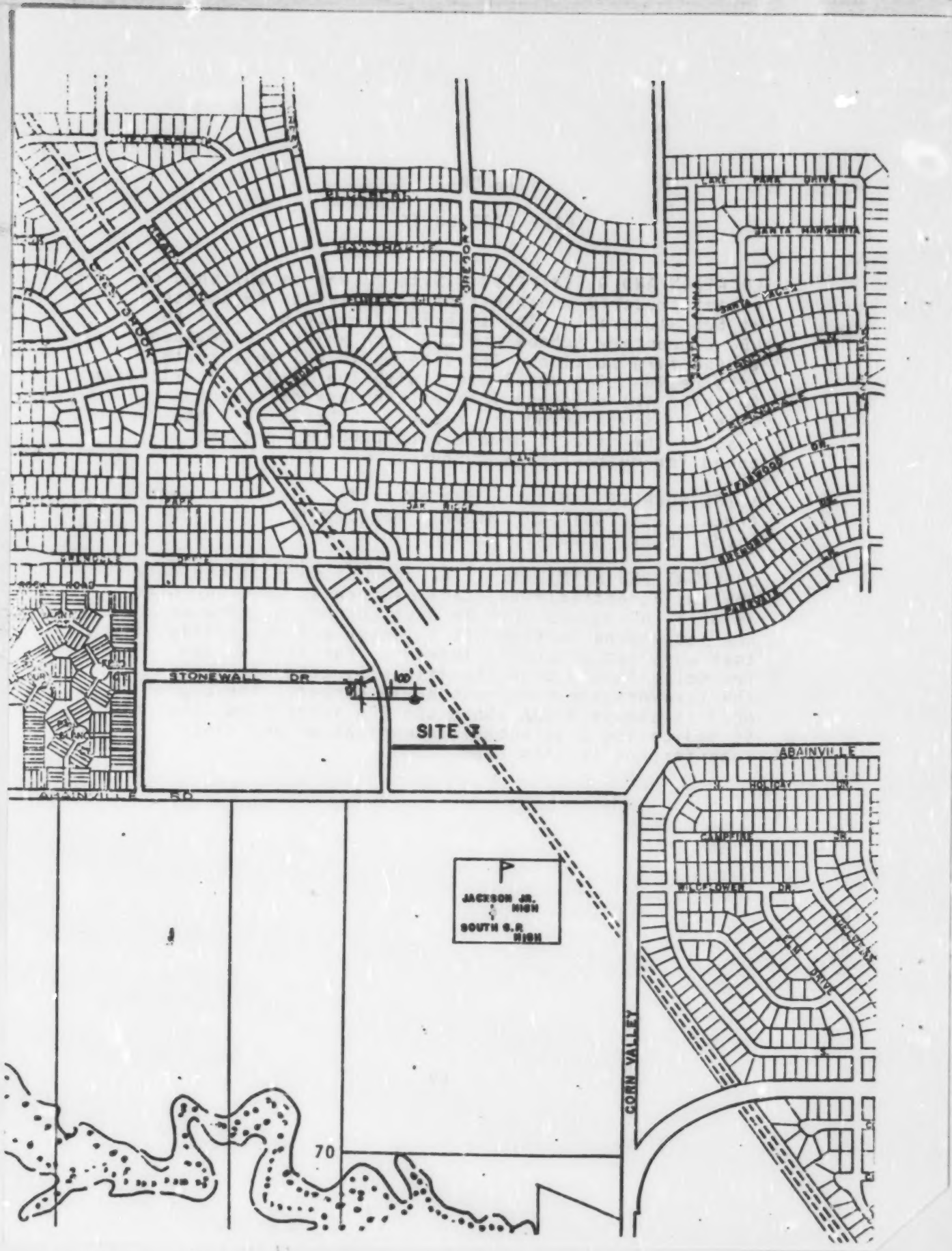
SITE GP-7

FIRE STATION #6

LOCATION AND DESCRIPTION. Site #7 was established on vacant property southeast of Fire Station #6 located at 606 Stonewall. The site is also southeast of the LBJ Elementary School and LBJ Park which are adjacent to the fire station. The site is immediately south of a residential development with the SF-3 classification. South of the site are located the Jackson Junior High and South Grand Prairie High Schools. To the east of the site is undeveloped property presently zoned for multi-family purposes.

NOISE SOURCES. Major: jet aircraft, light aircraft, trucks, automobiles. Minor: residential, insects, birds, barking dogs.

OBSERVATIONS FROM DATA. The time history of the data follows essentially the same pattern as does the data at GP-2, GP-3, and GP-6 in daylight hours. However, the jet engine testing has a lesser affect at this site than does jet aircraft flyovers. For this reason the noise levels drop significantly after dark when the flyovers are much reduced in number. The L_{dn} of 62.7 is almost 8 dBA above the EPA identified level of 55 indicating substantial communication and sleep interference in this area.


STONEWALL DR
SITE
ABAINVILLE
JACKSON JR. HIGH
SOUTH G.R. HIGH
GORN VALLEY
70
50

HOURLY "HAND-HELD METER" NOISE DATA AT GP-7

APRIL 19, 1974

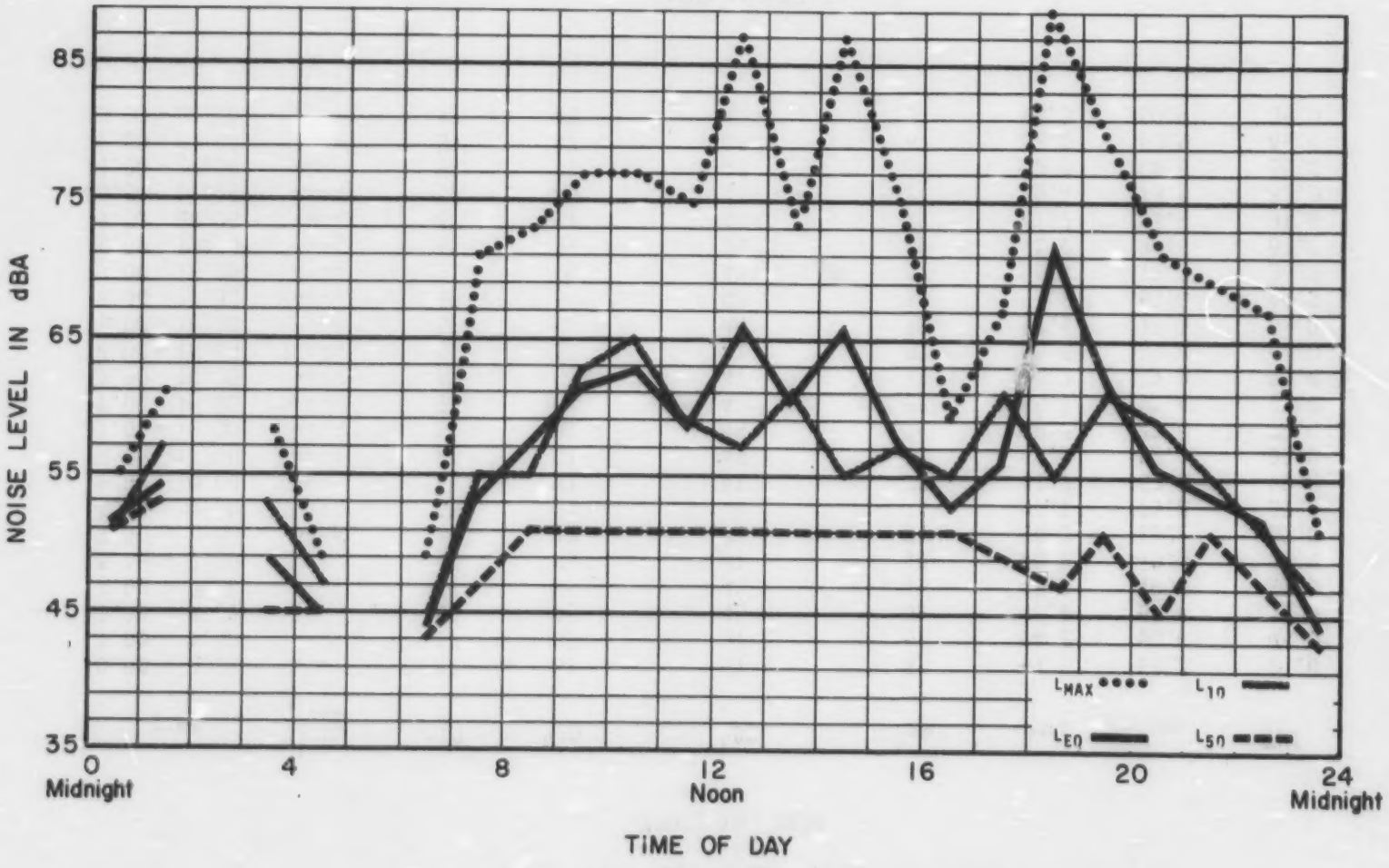
TIME	WIND SPEED	L_{10}	L_{50}	L_{90}	L_{max}	L_{eq}	L_{np}	TNI
0.00 - 0.50	----	51	51	51	55	51.5	54.3	21.0
1.00 - 1.50	----	57	53	51	61	54.2	60.3	45.0
3.00 - 4.00	----	53	45	45	59	48.9	57.4	47.0
4.00 - 5.00	----	47	45	43	49	45.0	49.6	29.0
6.00 - 7.00	----	45	43	41	49	43.9	48.8	27.0
7.00 - 8.00	none	55	47	41	71	54.2	69.2	67.0
8.00 - 9.00	----	55	51	41	73	57.7	73.8	67.0
9.00 - 10.00	----	63	51	41	77	61.7	83.0	99.0
10.00 - 11.00	----	65	51	45	77	62.9	82.3	95.0
11.00 - 12.00	----	59	51	45	75	58.7	73.4	71.0
12.00 - 13.00	----	57	51	47	87	65.7	80.4	57.0
13.00 - 14.00	----	61	51	41	73	60.7	79.8	91.0
14.00 - 15.00	----	55	51	41	87	65.6	83.8	67.0
15.00 - 16.00	----	57	51	45	75	57.5	71.1	63.0
16.00 - 17.00	----	55	51	47	59	52.8	61.0	49.0
17.00 - 18.00	----	61	49	43	67	55.9	71.7	85.0
18.00 - 19.00	----	55	47	43	89	72.2	94.6	61.0
19.00 - 20.00	----	61	51	41	79	61.7	81.9	91.0
20.00 - 21.00	----	59	45	41	71	55.4	73.8	83.0
21.00 - 22.00	----	55	51	45	69	53.9	64.6	55.0
22.00 - 23.00	----	51	47	43	67	52.2	63.9	45.0
23.00 - 24.00	----	47	43	41	51	44.3	50.9	35.0

SUMMARY OF NOISE LEVELS AT GP-7 FOR APPIL 19, 1974

DAILY INFORMATION: L_{MAX} = 89 L_{10} = 57 L_{50} = 49 L_{90} = 41

L_{EQ} = 62.1 L_{DN} = 62.7 L_{NP} = 78.7 TNI = 75.0 (Based on 15 daytime and 7 nighttime hours)

HOURLY INFORMATION



HOURLY "HAND-HELD METER" NOISE DATA AT GP-7

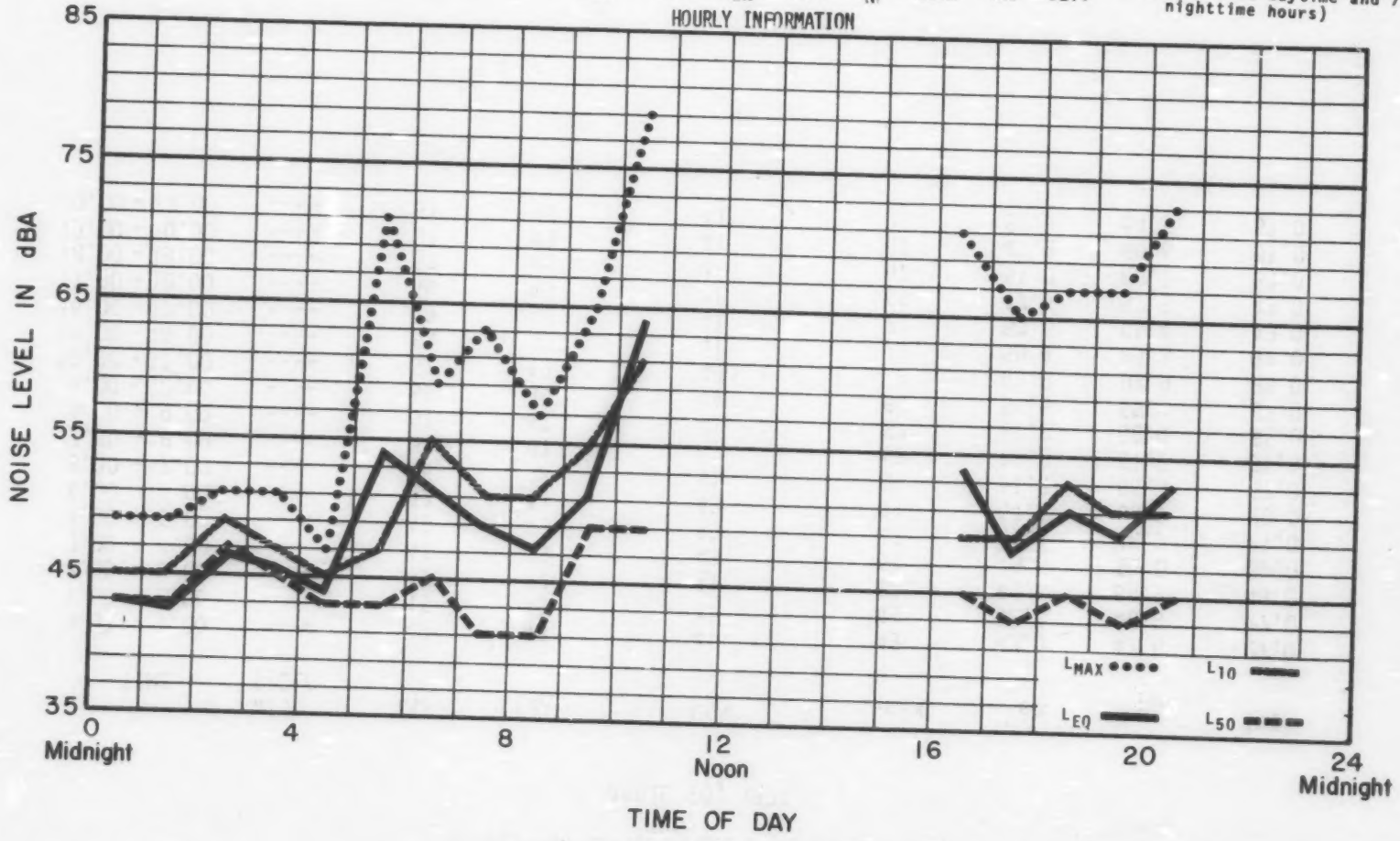
APRIL 20, 1974

TIME	WIND SPEED	L_{10}	L_{50}	L_{90}	L_{max}	L_{eq}	L_{np}	TNI
0.01 - 1.00	----	45	43	41	49	43.0	47.6	27.0
1.00 - 2.00	----	45	43	41	49	42.8	46.9	27.0
2.00 - 3.00	----	49	47	41	51	46.5	54.7	43.0
3.00 - 4.00	----	47	45	43	51	45.6	50.0	29.0
4.00 - 5.00	----	45	43	43	47	44.1	46.9	21.0
5.00 - 6.00	----	47	43	43	71	54.1	66.9	29.0
6.00 - 7.00	----	55	45	41	59	51.3	66.3	67.0
7.00 - 8.00	----	51	41	41	63	48.8	61.2	51.0
8.00 - 9.00	----	51	41	41	57	47.2	58.9	51.0
9.00 - 10.00	----	55	49	41	65	51.6	65.9	67.0
10.00 - 11.00	----	61	49	43	79	63.9	83.9	85.0
13.00 - 14.00	----	63	41	41	73	58.4	80.3	99.0
16.00 - 17.00	----	49	45	41	71	53.8	66.4	43.0
17.00 - 18.00	----	49	43	41	65	47.9	57.5	43.0
18.00 - 19.00	----	53	45	41	67	51.0	63.7	59.0
19.00 - 20.00	----	51	43	41	67	49.2	60.6	51.0
20.00 - 21.00	----	51	45	41	73	52.9	64.5	51.0

SUMMARY OF NOISE LEVELS AT GP-7 FOR APRIL 20, 1974

DAILY INFORMATION: L_{MAX} = 79 L_{10} = 51 L_{50} = 43 L_{90} = 41

L_{EQ} = 53.3 L_{DN} = 57.0 L_{NP} = 66.2 TNI = 51.0 (Based on 10 daytime and 7 nighttime hours)

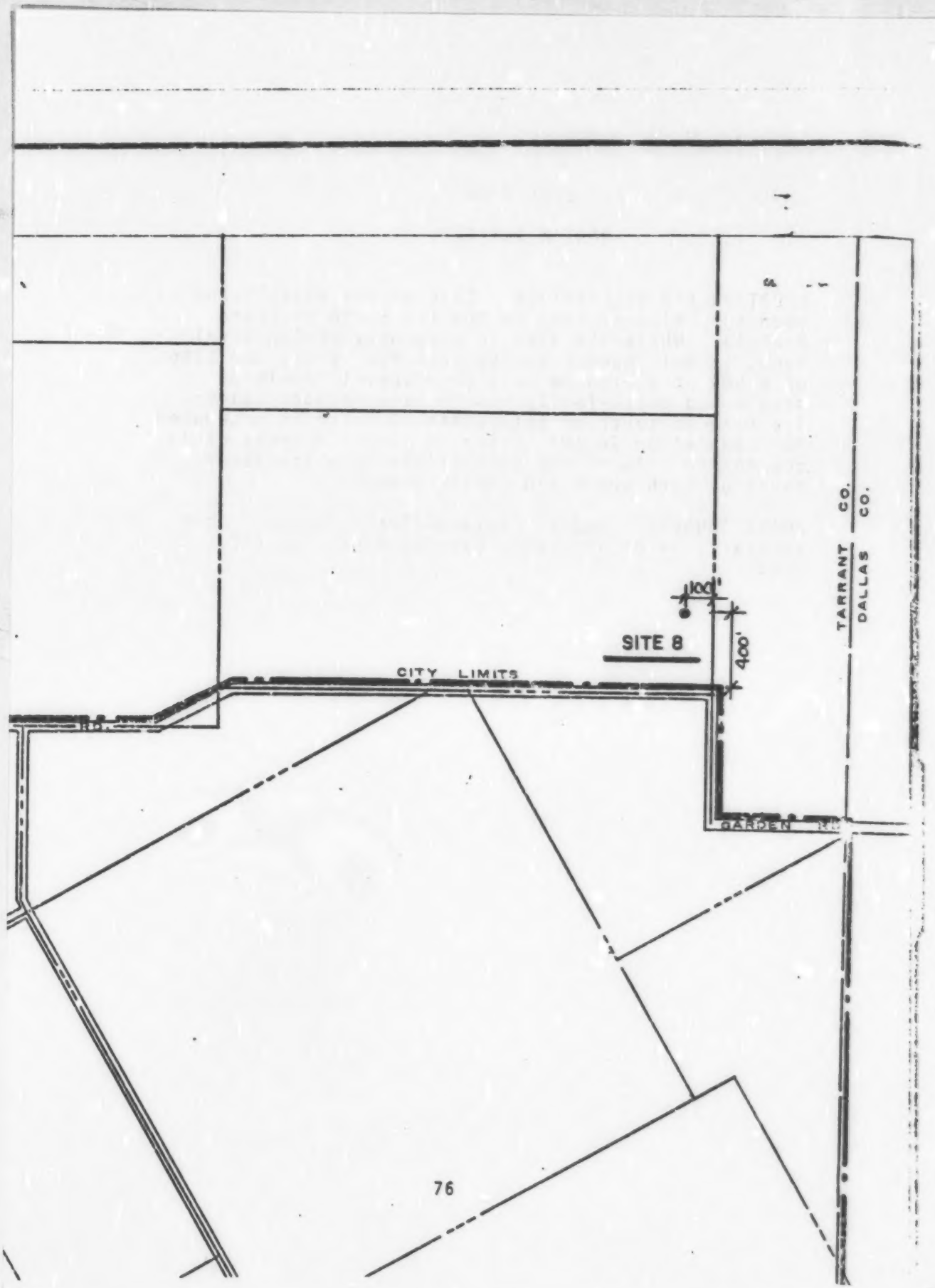


SITE GP-8

MARTIN PROPERTY

LOCATION AND DESCRIPTION. Site #8 was established on open agricultural land in the far south of Grand Prairie. While the area is presently agricultural land, it will become in the next five years the site of a 584 acre planned unit development involving single and multi-family housing and related usages. The site is south of Interstate 20 which is scheduled for completion in the spring of 1975. Approximately one-fourth mile to the east exists some scattered housing, both brick and mobile homes.

NOISE SOURCES. Major: automobiles. Minor: light aircraft, large aircraft, barking dogs, insects, birds.


TARRANT CO.
DALLAS CO.
100'
400'
SITE 8
CITY LIMITS
GARDEN

HOURLY "HAND-HELD METER" NOISE DATA AT GP-8

APRIL 19, 1974

TIME	WIND SPEED	L_{10}	L_{50}	L_{90}	L_{max}	L_{eq}	L_{np}	TNI
0.00 - 1.00	----	45	41	41	55	43.9	51.1	27.0
1.00 - 2.00	----	49	41	41	57	45.0	53.8	43.0
2.00 - 3.00	----	47	41	41	53	43.7	50.2	35.0
3.00 - 4.00	----	59	51	51	67	54.6	63.7	53.0
4.00 - 5.00	----	61	51	51	71	58.4	70.8	61.0
5.00 - 6.00	----	61	49	41	71	56.8	77.5	91.0
6.00 - 7.00	10 - 20	55	41	41	71	55.7	74.1	67.0
7.00 - 8.00	----	61	51	41	69	56.1	74.4	91.0
8.00 - 9.00	----	55	53	51	71	53.7	58.6	37.0
9.00 - 10.00	----	59	53	51	65	55.6	64.2	53.0
10.00 - 11.00	----	61	53	51	81	61.5	73.9	61.0
11.00 - 12.00	----	63	55	51	69	59.0	71.2	69.0
12.00 - 14.00	----	61	53	43	77	61.9	81.9	85.0
14.00 - 16.00	----	67	59	49	89	69.3	90.2	91.0

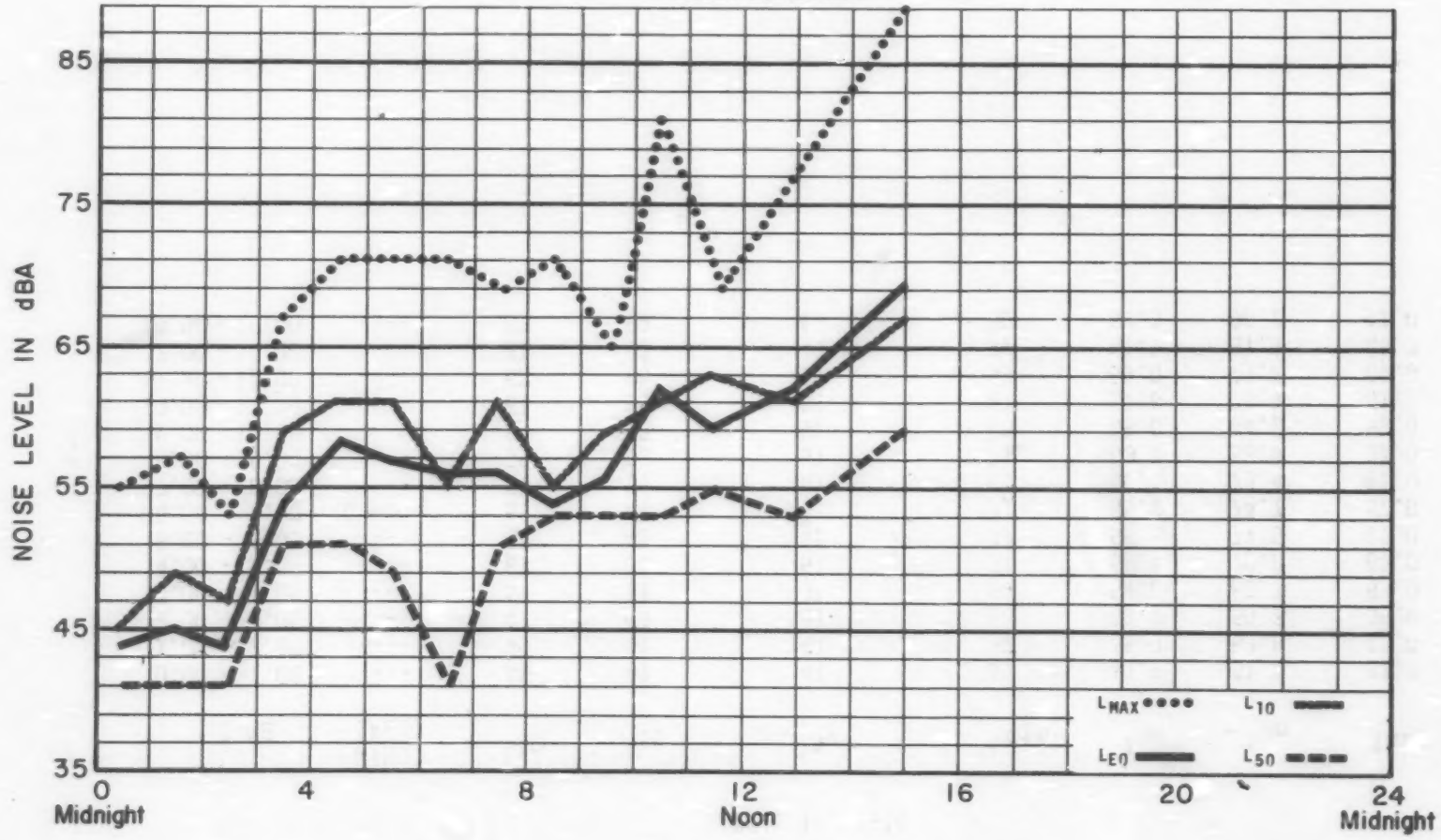
SUMMARY OF NOISE LEVELS AT GP-8 FOR APRIL 19, 1974

DAILY INFORMATION: L_{MAX} = 89 L_{10} = 61 L_{50} = 51 L_{90} = 41

L_{EQ} = 62.1 L_{DN} = 64 L_{NP} = 81.7 TNI = 91

HOURLY INFORMATION

(Based on 7 daytime and 7 nighttime hours)



HOURLY "HAND-HELD METER" NOISE DATA AT GP-8

APRIL 20, 1974

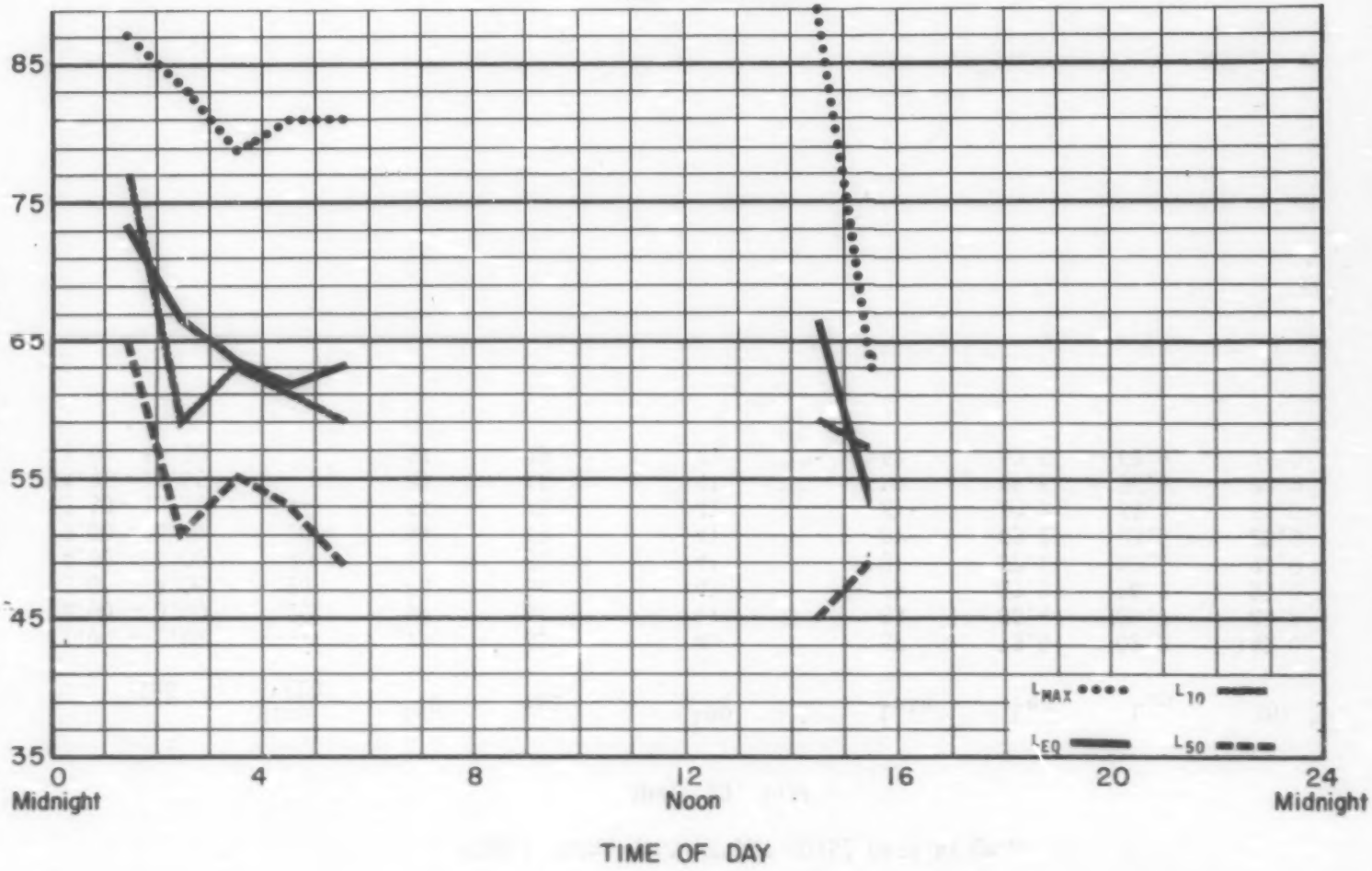
TIME	WIND SPEED	L_{10}	L_{50}	L_{90}	L_{max}	L_{eq}	L_{np}	TNI
1.00 - 2.00	----	77	65	43	87	73.5	102.9	149.0
2.00 - 3.00	20	59	51	41	83	66.4	89.7	83.0
3.00 - 4.00	20	63	55	41	79	63.3	86.3	99.0
4.00 - 5.00	20	61	53	41	81	62.1	83.5	91.0
5.00 - 6.00	20	59	49	41	81	63.2	83.3	83.0
13.30 - 13.50	----	55	45	41	61	50.3	63.8	67.0
14.00 - 14.55	----	59	45	41	89	66.5	86.8	83.0
15.00 - 15.50	----	57	49	41	63	53.5	69.9	75.0

SUMMARY OF NOISE LEVELS AT GP-8 FOR APRIL 20, 1974

DAILY INFORMATION: L_{MAX} = 89 L_{10} = 65 L_{50} = 51 L_{90} = 41
L_{EQ} = 67.1 L_{DN} = 76.6 L_{NP} = 92.2 TNI = 107

(Based on 3 daytime and 5 nighttime hours)

HOURLY INFORMATION



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APPENDIX B

INSTRUCTIONS FOR NOISE MONITORING STATIONS

INSTRUCTIONS FOR NOISE MONITORING STATIONS

GENERAL DESCRIPTION OF WORKLOAD

One data sheet is to be completed during each hour of operation. During the first 20 minutes of each hour, the sound level will be recorded at 10 second intervals. Also, the tape recorder will be turned "on" at 5 minute intervals during this first 20 minutes of each hour. The recorder should be on for approximately 20 seconds at each 5 minute interval.

During the next 10 minutes of a given hour, weather data will be recorded. Then follows another 20 minute period of noise data taking similar to the first 20 minute period. The last 10 minutes of the hour will be used for calibration of the sound level meter.

PRELIMINARIES

Prior to the first sampling, the sound level meter must be calibrated. Depress the button marked "A", i.e., all data should be A-weighted. Turn the instrument "on" and check the condition of the batteries, replacing them if necessary.

Make sure that the button marked "FAST" is in

the "on" position. Turn the knob on the side of the instrument, called the attenuator, until the meter scale will read a sound pressure level between 90 and 100 decibels. After the sound level meter has warmed up a few minutes, place calibrator over the microphone (with windscreen removed). Start calibrator by depressing (and then releasing) the button on the side of the calibrator. Use a small screwdriver to adjust meter reading to 94 dB. Remove calibrator and replace windscreen. The calibrator will turn itself off in about one minute after the button on its side was last depressed. On the data sheet, record this calibration level in the blank labeled "CAL. BEGIN".

At the top of the data sheet, fill in your site (such as "GP-1"), name, day of week, date, and the time that you will begin taking your data. If the battery "checked", mark this on the sheet. Make certain that "FAST" and "A" buttons on meter are in the "on" position, and mark the data sheet to indicate that you have checked these meter settings. Also, make certain that the tape recorder is loaded and that it will run.

TAKING NOISE DATA

Always begin each hour of data collection at the

beginning of a clock hour. First, make a 20 second tape recording and turn off the machine. Care should be taken to be quiet during this recording so as not to mask the environmental noise sources that are being documented. Then begin taking sound level readings at ten second intervals by reading the sound level meter and marking the appropriate box on the data sheet. The boxes at each noise level are to be marked in succession. That is, if during the first hour of data sampling there were 17 readings made at the 64-66 dBA level, then the first 17 boxes of the row labeled 64-66 dBA should be marked.

After 5 minutes, start the tape recorder, and after approximately 20 seconds turn off the recorder and continue taking noise level readings for another 5 minutes. Then turn on the tape recorder for another 20 seconds.

Continue this process until you have taken 20 minutes of noise level data, and have made five 20 second recordings.

During the next 10 minutes, the weather data will be recorded. Moisten the "wet" bulb of the psychrometer with the water provided in the small plastic

bottle. Grasp the metal handle at the end of the chain and swing the psychrometer in a circle. After about 2 or 3 minutes, stop swinging the psychrometer. It is suggested that you "follow through" as you stop so as not to damage the instrument. Read both the wet and dry bulb temperature and calculate the relative humidity on the special slide rule provided. Record the relative humidity and temperature on the data sheet.

Also record the wind direction, wind speed and the time that you took the weather data. The directions for using the wind speed meter are printed on the device. A magnetic compass is provided for reference in determining the wind direction. Give a brief description of the sky and wind conditions where indicated on the data sheet. (Example: SKY: Partly cloudy, WIND: Gusting and variable.)

After 10 minutes have elapsed since the last noise level reading was made, you will make a 20 second tape recording and begin taking noise level readings. Continue for 20 minutes in the same manner as you did during the first 20 minute period. The last 10 minutes of the hour is to be used to again calibrate the sound level meter and to answer the questions

at the top of the data sheet. When you place the calibrator over the microphone and switch to the scale which will read 90-100 dB, and before you make any adjustment to the meter, start the calibrator and record the meter reading on the data sheet in the blank labeled "CAL. FINISH". Then make your calibration. After answering the questions at the top of the data sheet, prepare a new data sheet for the next hour.

A FEW HINTS

If the time, date, and site is recorded on the cassette tape at the beginning of each hour, then the cassette tape data can easily be correlated with the data sheets. Also, if some unusual event occurs during the data collection, by placing a letter or some other distinguishable mark in the appropriate noise level boxes on the data sheet and writing a note identifying the noise source, the noise level information for that source will be preserved for later analysis.